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ABSTRACT

This is the second volume of a four-volume report of a research project designed to (1) identify job needs for agricultural occupations which will result from the Muskegon County Wastewater Management System and perform a task analysis on each occupation, (2) develop instructional modules and determine their place in either high school or 2-year college programs, and (3) implement an articulated curriculum with actual programs. This volume focuses on the first objective--task analysis. The introductory section discusses project activities performed in analyzing tasks for related occupations and occupations concerned with wastewater management systems. The majority of the document (211 pages) is composed of task analysis results for the occupations identified: wastewater treatment operator, wastewater treatment laboratory technician, agricultural equipment mechanic, farm equipment operator, farm manager, field supervisor, irrigator, and grain drier operator. Using a column format, the following information is presented for each occupation: Job skills (percent indicated entry skill and relative importance in percentages), job knowledges (relative importance in percentages), job behaviors (relative importance in percentages), and basic skills (relative importance in percentages). The four appendixes contain information related to data collection, with appendix A illustrating the format used to collect data pertaining to job skills, knowledges, behaviors, and basic skills for the occupations studied. (SH)

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FINAL REPORT

VOLUME II OF IV VOLUMES - TASK ANALYSIS RESULTS

PROJECT NO. V0218VZ
GRANT NO. OEG-O-74-1669

A STUDY OF JOB DEMANDS AND CURRICULUM DEVELOPMENT IN AGRICULTURAL TRAINING RELATED TO THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM

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JANUARY, 1976

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PREFACE

This volume is one of four volumes prepared by staff in the Vocational Education Department, Muskegon Area Intermediate School District, as a part of the research project entitled, "A Study of Job Demands and Curriculum Development in Agricultural Training Related to the Muskegon County Wastewater Management System." The project was funded under a contract with the Bureau of Occupational and Adult Education, U.S. Office of Education. The final report consists of the following volumes:

Volume I:	An Overview of the Research Project
Volume II:	Task Analysis Results
Volume III:	Student Terminal Performance Objectives and Instructional Modules
Volume IV:	Career Awareness Information

Citizens in Muskegon County, Michigan were fortunate in the late 1960's to receive federal, state and local dollars for the construction of a 40+ million dollar "demonstration" wastewater treatment system. It was the opinion of many concerned individuals that a wastewater land treatment system would stimulate the Muskegon economy and restore lakes, streams, and rivers to a condition of purity most Americans had almost given up the hope of achieving. The research project grew out of a need to identify the jobs and training needs of individuals desiring to work in wastewater land treatment systems and related agricultural occupations. It was anticipated that hundreds of new agricultural related jobs would emerge in the region as a result of the Muskegon farm irrigation system.

The purposes of this project were: (1) To identify job needs for agricultural occupations which will result from the Muskegon County Wastewater Management System and perform a task analysis on each occupation; (2) To develop instructional modules and determine their place in either high school or two-year college programs; and (3) Implement an articulated curriculum with actual programs and gain approval for funding.

ACKNOWLEDGEMENTS

Since the inception of the project, many persons have made significant contributions to the development of the materials included in the final report. Appreciation is expressed to Jack A. Wilson, Project Officer, Research Branch, Division of Research and Demonstration, Bureau of Occupational and Adult Education, U.S. Office of Education, for his direction during the preparation of this information. Gratitude is also expressed to the many local, state, and national agency representatives and industries who have given invaluable assistance in this project.

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INTRODUCTION

One of the specific objectives of the research project was to identify the agricultural occupations in the Muskegon County Wastewater Management System and perform a task analysis on each occupation. With the assistance of Muskegon County employees working in the County's 40+ million dollar wastewater land treatment project, the research staff identified the following agricultural occupations on the site:

a. Wastewater Treatment Operator

b. Wastewater Treatment Laboratory Technician

c. Agricultural Equipment Mechanic

d. Farm Equipment Operator

e. Farm Manager

f. Field Supervisor

g. Irrigator

h. Grain Drier Operator

Instrument Development

The research team wanted to know what job skills, job knowledges, behaviors, and basic skills were needed to succeed in the occupations studied. Ms. Jan Danford, former Director of Curriculum and Instruction at the Capital Area Career Center in Mason, Michigan, provided the staff with sample instruments used by the Center in performing task analyses on various occupations. The content and format of the instrument obtained from the Capital Area Career Center was revised to meet the needs of the Muskegon Area Intermediate School District (MAISD) research project. Task statements for several agricultural occupations under study were received from Michigan State University, Montana State University, and The Ohio State University. Such information assisted the research team in developing some of the needed instruments. Due to the fact that the staff was unable to locate task lists for some of the occupations studied, personal interviews were conducted by the staff to identify the duties of individuals working in the Muskegon County Wastewater Land Treatment System. Instruments were developed for each occupation and field tested. Several revisions were made in order to clarify the wording in the directions for completing the instruments as well as task statements. Appendix A, pages 235 to 244 illustrates the format used to collect data pertaining to job skills, knowledges, behaviors, and basic skills for the eight agricultural occupations studied.

Data Collection

Several instructors of vocational agriculture in the Western part of Michigan were used to assist the project staff in collecting the research data. All data collectors participated in a training session designed to equip one with the necessary basic skills for collecting field data. See Appendix B, pages 245 to 248 for information used in training data collectors. The number of responses for each occupation was favorable.

Rating Scale

Given the opportunity to become familiar with the operation of the industry or farm during the first 60 days on the job, the respondents were asked to indicate whether each job skill was needed for entry level employement. When more than 40 percent of the respondents declared that a job skill was needed for entry within the first 60 days on the job, this information was used by the staff in writing student terminal performance objectives, and instructor's modules for certain occupations. If less than 40 percent of the respondents declared that a job skill was not needed for job entry within the first 60 days on the job, the job skill should be reviewed by future module developers in order to determine whether such information should be included in modules of instruction. Each job skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equaled the sum of the weights of each category (Weight for each category was determined by the percentages of responses per category x weighted value of category).

Job knowledges were associated with specific job skills. If 33 percent or more of the respondents indicated that a job knowledge was "essential", the statement was used in writing student terminal performance objectives. Items which were declared essential by less than 33 percent of the respondents were marked "to be reviewed".

A list of common Job Behaviors and Basic Skills were included in the instruments for the occupations under study. If 33 percent or more of the respondents declared that a behavior or basic skill was "essential", such information was considered in writing student terminal performance objectives. If less than 33 percent of the respondents declared that a behavior or basic skill was "essential", the behavior or basic skill should be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

Data Processing

The Capital Area Career Center key punched and computerized the research data. The location of the task analysis results for each agricultural occupation studied is found in this volume of the final report as indicated on the page to follow.

Occupational Titles — Page

Wastewater Treatment Operator

Wastewater Treatment Laboratory Technician

Agricultural Equipment Mechanic

Farm Equipment Operator

Farm Manager

Field Supervisor

Irrigator

Grain Drier Operator

The task of enhancing the learning process of students at all levels of education appears to be a continuous responsibility of educators. Identifying the skills, knowledges, and attitudes required for entry level employment as perceived by employers in the real world of work is certainly an important step for improving instruction. A second and third step which could be used to improve the instructional process is the writing of student terminal performance objectives and instructional modules. Student terminal performance objectives for each occupation included in this study and examples of instructional modules can be seen in Volume III of the Final Report.

TASK ANALYSIS RESULTS FOR WASTEWATER TREATMENT OPERATOR

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
Treating Waste							
1. Mechanically operate aeration equipment for desired treatment	93	-	-	20	13	66	44.2
2. Inspecting Meters, Gauges and test results to determine required treatment	80	13	6	6	26	53	41.2
3. Monitoring control panels for determining aeration action in waste	80	13	-	-	46	33	36.2
4. Inspecting aerators	93	6	6	20	40	33	40.3
5. Inspecting Mixers	86	13	-	13	40	33	37.7
6. Mechanically Operating Mixers	86	6	-	26	20	46	39.4
7. Mechanically discharging effluent from aeration cell into settling tank	93		13	13	26	46	39.9
8. Removing, disassembling and repairing aerators	73	20	-	13	33	40	39.1
9. Reassembling and installing aerators	73	13	-	6	40	40	39.1
10. Removing, disassembling and repairing mixers	73	20	-	6	46	33	38.7
11. Reassembling and installing mixers	80	13	-	6	40	46	42.1
12. Mechanically open and close settling tank gates	86	-	6	26	33	33	38.7
13. Inspecting gates for obstructions	93	-	6	13	40	40	41.1
14. Recording amount of effluent in settling tank	86	13	-	13	46	26	36.6
15. Mechanically operate structures to regulate effluent flow to canals	86	6	-	26	33	33	38.1

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES: NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
Using Chlorine							
16. Changing chlorine cylinders	100	-	-	-	26	73	46.9
17. Recording chlorine cylinders identification numbers	93	-	6	6	66	20	39.4
18. Mechanically handling chlorine cylinders	93	-	6	6	33	53	42.7
19. Weighing and recording chlorine cylinders	93	-	6	-	40	46	40.2
20. Inspecting gauges on evaporator	73	6	6	6	26	46	37.0
21. Operating evaporator	73	6	-	13	26	46	37.9
22. Operating chlorinator	100	-	-	6	20	73	46.3
23. Inspecting pumps for proper operation	93	-	6	6	26	60	43.4
24. Inspecting evaporator for proper operation (heat and pressure)	73	6	13	6	20	46	36.0
25. Inspecting chlorinators for proper operation (pressure and leaks)	93	-	6	-	20	73	45.7
26. Recording the amount of chlorine used daily	100	6	-	-	53	40	41.8
27. Unloading full chlorine cylinders and storing on specified site	100	6	-	6	26	60	42.8
28. Storing and loading empty chlorine cylinders	93	6	-	13	33	46	40.7
Irrigation Station							
29. Inspecting spillway in channel to irrigation station for obstructions	86	6	-	13	46	33	39.4
30. Cleaning bar screens at irrigation stations	93	-	6	6	46	40	41.4
31. Recording water level at irrigation stations	73	-	6	20	46	26	38.6
32. Operating pumps at irrigation stations	93	-	-	-	40	53	42.5
33. Recording pressure, number of pumps operating and hours operated	93	6	-	13	33	46	40.7

VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
34. Inspecting pumps for proper operation	93	-	-	13	26	60	44.3
35. Shutting down pumps and restarting for irrigating	86	6	6	-	40	46	40.8
36. Monitoring water levels in channels and at stations	80	-	6	6	60	26	40.0
Discharging Effluent to Storage Lagoons							
37. Operating drainage pumps	100	-	-	20	46	33	40.9
38. Inspecting drainage pumps	93	-	-	13	60	26	40.9
39. Adjusting pumps for automatic operation	80	6	6	6	53	26	37.8
40. Discharging flow of effluent to storage lagoons	80	20	-	13	40	20	31.9
41. Discharging flow of effluent to final settling tank	86	13	-	20	40	26	36.3
Maintenance at Pumping Stations							
42. Replacing packing flanges on electric pumps	73	6	-	13	20	40	32.5
43. Replacing light bulbs	86	13	33	20	26	6	27.3
44. Cleaning up around irrigation station	80	13	20	20	26	20	31.7
45. Observing drainage ditches for erosion	80	13	-	13	40	33	37.7
46. Inspecting for obstructions in culverts	86	13	-	26	33	26	35.3
Sprinkler System							
47. Mechanically operate the sprinkler system	93	6	-	13	33	46	40.7
48. Monitoring the gauges	93	6	-	6	53	33	40.1
49. Determining the amount of water required	73	13	-	6	53	26	37.3
50. Determining the pressure requirements	73	13	-	6	40	40	39.1

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
51. Adjusting the spray bars	73	13	-	26	26	26	32.5
52. Inspecting the sprinkler system for proper operation	86	6	-	-	53	40	41.8
53. Cleaning the spray nozzles and flushing the line	86	13	-	20	40	26	36.3
54. Inspecting and aligning the sprinkler rig	80	6	-	-	60	33	41.1
55. Repairing flat tires	80	13	13	26	13	33	33.4
56. Changing burned out motors	80	13	6	13	40	26	35.4
57. Replacing coupling gaskets	80	6	6	6	46	20	32.0
58. Using safety practices in operating irrigation rigs	93	6	-	-	20	73	45.1
59. Greasing and lubricating the irrigation rig per manufacturer's specifications	80	6	6	-	46	33	36.7
60. Inspecting outfalls for erosion and other damages	73	20	6	6	46	20	33.4
Maintaining Vehicles in Good Working Order							
61. Changing oil, oil filter and lubricating as per manufacturer's specifications	73	13	6	20	40	20	34.5
62. Checking and filling automatic transmission as per manufacturer's specifications	60	13	13	33	26	13	30.7
63. Checking and filling manual transmission as per manufacturer's specifications	60	13	13	26	33	13	31.4
64. Checking and filling rear axles as per manufacturer's specifications	66	13	13	26	33	13	31.4
65. Checking and filling four wheel drive transfer case as per manufacturer's specifications	66	20	6	26	40	6	30.0

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
66. Checking and filling brake fluid as per manufacturer's specifications	66	20	6	26	40	6	30.0
67. Checking and filling power steering as per manufacturer's specifications	73	20	6	26	40	6	30.0
68. Inspecting and adjusting belts as per manufacturer's specifications	73	13	6	33	33	13	32.1
69. Keeping maintenance records on each truck	73	20	-	20	26	20	28.4
70. Checking oil, water, tire pressure and battery periodically as per manufacturer's specifications	86	13	-	33	33	13	30.9
71. Operating trucks in a safe and careful manner	93	6	-	-	26	53	37.5
72. Cleaning and washing trucks	86	13	13	40	26	6	29.3
73. Checking gates for security reasons	93	6	13	26	20	26	32.0
74. Cleaning and washing down workshop area	86	6	6	33	26	26	35.1
75. Operating vehicles in removing snow from specified site areas	86	6	6	40	26	13	30.7
76. Selecting appropriate tools and removing ice and snow from drainage pump	86	13	6	33	26	13	29.3
77. Initiating or recommending new or improved practices	60	13	-	26	53	-	30.3
78. Maintaining shift log and recording meter and gauge readings	86	6	-	13	40	33	37.0
79. Maintaining effective communications and working relationships with other employees, government officials and the general public	86	6	-	6	33	46	38.6

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES: NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
General Skills							
80. Identifying potential safety hazards on equipment	93	-	-	6	40	53	44.3
81. Identifying various hand and power tools	100	-	-	33	33	33	39.6
82. Selecting appropriate hand and power tools for specific jobs	100	-	-	33	26	40	40.3
83. Storing tools properly	93	6	-	33	20	40	38.5
84. Identifying various sources of supplies	73	13	6	20	33	26	34.7
85. Determining the amount of supplies to keep on hand	60	26	6	20	40	6	28.8
86. Determining when to order supplies	53	33	6	26	20	13	26.8
87. Determining the quantity of supplies to purchase at one time	53	33	13	20	20	13	26.4
88. Determining which supplies to order	53	33	6	26	26	6	25.7
89. Comparing costs of supplies from various sources	53	33	13	20	26	6	25.3
90. Evaluating the quality of various manufacturer's supplies	53	33	20	20	20	6	24.3
91. Wearing appropriate clothing	93	6	6	20	26	40	38.2
92. Interpreting chemical labels	100	6	6	26	6	53	38.5
93. Providing proper ventilation when needed	93	6	-	26	20	46	39.4
94. Applying wood and metal preservatives	80	13	20	33	20	13	29.7
95. Developing lists of materials needed for repairs	73	20	-	33	20	26	32.9
96. Determining cost of repairs needed	53	26	6	33	20	6	24.7
97. Ordering repair parts	60	20	6	33	26	6	26.5
98. Cleaning and oiling electric motors	100	-	-	20	40	40	42.0
99. Replacing fuses	86	13	-	13	33	40	38.4
100. Replacing electrical switches	73	13	6	20	33	26	34.7
101. Wiring simple electrical circuit	73	20	-	20	26	26	31.4
102. Installing electric motors	73	13	6	13	26	33	33.3

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES: NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
103. Resetting circuit breakers	100	-	-	13	53	26	38.1
104. Repairing broken electrical wires	80	13	-	13	33	33	34.9
105. Replacing lighting fixtures	86	13	13	20	26	20	30.3
106. Replacing electric motor belts and pulleys	86	-	6	20	33	26	33.4
107. Cutting weeds and grass around buildings	86	13	26	13	20	26	31.4
108. Replacing water pipes	73	13	6	20	26	26	31.9
109. Repairing faucets	86	20	-	26	33	13	29.5
110. Replacing valves in water system	80	20	-	33	20	20	29.9
111. Replacing window panes	53	26	40	6	20	6	23.4
112. Using telephone	80	13	33	13	6	33	30.7
113. Writing letters	60	26	26	20	13	13	25.5
114. Filing various items of information	73	13	33	13	13	26	30.0
115. Meeting with various persons to discuss problems	66	13	6	20	20	26	29.5
116. Establishing priorities on jobs to be completed	46	33	6	-	20	33	29.0
117. Planning work schedule for workers	33[c]	40	13	6	13	20	23.6
118. Training workers to perform various jobs	33[c]	40	6	-	13	26	23.4
119. Evaluating worker's performance	26[c]	46	13	-	13	13	18.9
120. Assigning specific responsibilities to workers	20[c]	53	6	-	13	13	18.2
121. Hiring employees	20[c]	53	6	-	13	13	18.2
122. Firing employees	20[c]	53	6	6	13	6	16.5

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important - 4; and Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

[c] If less than 40 percent of the respondents declared that the skill was not needed for job entry, the skill is to be reviewed by module developers in order to determine whether such information should be included in modules of instruction.

VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Treating Waste					
1. Biological processes which occur in the wastewater treatment aeration cells	40	6	53	X	
2. Basic operating principles of the aeration equipment	73	6	20	X	
3. The effects environmental conditions have on the aeration process	46	6	46	X	
4. Uses of meters and gauges in treating waste	86	6	6	X	
5. How to read meters and gauges	86	-	13	X	
6. The functions of meters and gauges in treating waste	60	-	40	X	
7. The operating principles of the monitoring control panels in treating waste and the importance of operating properly	66	-	33	X	
8. How to check aerators for proper functioning	66	-	33	X	
9. How to complete appropriate forms when checking conditions of aerators	33	13	53	X	
10. How to check mixers for proper functioning	60	-	40	X	
11. How to complete appropriate forms when checking conditions of mixers	33	13	53	X	
12. Basic operating principles of mixing equipment	53	-	46	X	
13. The effects environmental conditions have on the mixing process	40	6	53	X	
14. Basic operating principles of gates in treating and discharging waste	46	6	46	X	
15. Relationship of head and gate opening and flow of water	40	6	53	X	
16. Biological and physical processes which occur in the settling tanks	33	6	60	X	
17. The importance of selecting and using appropriate tasks for removing, disassembling, repairing, reassembling and installing aerators	46	-	53	X	
18. The importance of using safety practices in removing and installing aerators	73	-	26	X	
19. How to remove, disassemble and repair aerators	40	-	60	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PECENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
20. How to reassemble and install aerators	40	-	60	X	
21. The importance of selecting and using appropriate tools for removing, disassembling, repairing, reassembling and installing mixers	46	-	53	X	
22. The importance of using safety practices in removing and installing mixers	86	-	13	X	
23. How to remove, disassemble and repair mixers	33	-	66	X	
24. How to reassemble and install mixers	33	-	66	X	
25. How to mechanically open and close settling tank gates	60	6	33	X	
26. How to inspect gates for obstructions and complete appropriate forms	46	6	46	X	
27. How to record amount of effluent in settling tank	46	6	46	X	
28. The operating concepts of the structures used to regulate effluent flow	46	6	46	X	
29. How to change cylinders	86	6	6	X	
30. The importance of using safety practices in changing chlorine cylinders	93	-	6	X	
31. How to record chlorine cylinders identification numbers on appropriate forms	60	6	33	X	
32. How to handle chlorine cylinders	93	-	6	X	
33. Basic operating principles of chlorine cylinders	80	6	13	X	
34. The process which occurs when chlorine comes in contact with water	46	6	46	X	
35. The reactions that occur as chlorine comes into contact with air, metal, cloth, and humans	73	-	26	X	
36. The importance of using safety practices when handling chlorine	93	-	6	X	
37. Basic operating principles of the electric hoist	46	6	46	X	
38. How to weigh and record chlorine cylinders	66	13	20	X	
39. How to inspect gauges on evaporator	60	6	33	X	
40. Basic operating principles of the evaporator	46	6	46	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
41. How to operate evaporator	53	-	46	X	
42. Basic operating principles of the chlorinator	66	-	33	X	
43. How to operate chlorinator	80	-	20	X	
44. How to inspect chlorine pumps for proper operation	53	-	40	X	
45. How to inspect evaporator for proper operation	53	-	46	X	
46. How to inspect chlorinator for proper operation	66	-	33	X	
47. How to record chlorine used daily	66	6	26	X	
48. How to unload chlorine cylinders	73	6	20	X	
49. How to store and load empty chlorine cylinders	73	6	20	X	
Irrigation Station					
50. How to inspect spillway in channel for obstructions	66	6	26	X	
51. The use of bar screens	66	-	33	X	
52. How to clean bar screens	60	6	33	X	
53. How to record water levels	53	6	33	X	
54. Basic operating principles of irrigating pumps	53	-	46	X	
55. How to operate irrigation pumps	60	-	40	X	
56. How to record operating output of irrigation pumps	46	-	40	X	
57. How to inspect irrigation pumps for proper operation	60	-	40	X	
58. How to monitor water levels in channels and at irrigation stations	60	6	26	X	
Discharging Effluent to Storage Lagoons					
59. How to operate drainage pumps	66	-	33	X	
60. How to inspect drainage pumps for proper operation	60	-	40	X	
61. How to make proper adjustments on drainage pumps for automatic operation	46	-	46	X	
62. How to discharge effluent into storage lagoons	60	13	26	X	
63. How to discharge effluent into final settling tanks	66	6	26	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Maintenance of Pumping Stations					
64. How to replace flanges on electric pumps	46	6	33	X	
65. How to replace light bulbs	53	13	33	X	
66. How to clean up around the irrigation station	66	6	26	X	
67. The importance of a clean work environment	73	-	26	X	
68. How to inspect drainage ditches for soil erosion	53	20	26	X	
69. Reasons for preventing soil erosion	53	13	33	X	
70. How to inspect culverts for obstructions	60	13	26	X	
71. Basic operating principles of the sprinkling system and the process of the effluent filtering throught the soil, collecting in the drainage tile and flowing to the receiving waters	40	20	40	X	
72. How to operate sprinkling irrigation system and the chemical and physical reactions which take place in the soil with regard to the effluent	60	13	26	X	
73. How to monitor gauges	66	6	26	X	
74. The use of gauges in the sprinkling irrigation system	53	13	33	X	
75. How to determine required amount of water needed for irrigating various soil types	33	26	40	X	
76. How to determine the pressure requirements in irrigating effluent	46	20	33	X	
77. The reasons for the use of pressure in irrigating	46	6	46	X	
78. How to adjust spray bars on irrigation rig	53	13	33	X	
79. How to inspect the sprinkler system for proper operation	66	6	26	X	
80. How to clean spray nozzles and flush lines	60	13	26	X	
81. The importance of cleaning spray nozzles and flushing lines	53	13	33	X	
82. How to inspect the sprinkler rig for proper operation	66	6	26	X	
83. How to align the sprinkler rig	66	6	26	X	
84. How to repair flat tires	26	20	53		X
85. How to replace burned out motors	26	13	60		X
86. How to replace coupling gaskets	33	-	53	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
87. How to inspect outfall for erosion and other damages	53	13	33	X	
88. The importance of greasing and lubricating the irrigation rig per manufacturer's specifications	73	6	20	X	
89. How to grease and lubricate irrigation rigs	66	6	26	X	
90. The importance of using safety practices in operating irrigation rigs	93	-	6	X	
Maintaining Vehicles in Good Working Order					
91. How to change oil, oil filter and lubricate pick-up trucks as per manufacturer's specifications	46	20	33	X	
92. How to check and fill automatic transmission as per manufacturer's specifications	33	26	40	X	
93. How to check and fill manual transmission as per manufacturer's specifications for pick-up trucks	33	26	40	X	
94. How to check and fill rear axles with appropriate fluids as per manufacturer's specifications for pick-up trucks	33	26	40	X	
95. How to check and fill four-wheel drive transfer case as per manufacturer's specifications for pick-up trucks	33	26	40	X	
96. How to check brakes and add brake fluid as per manufacturer's specifications for pick-up trucks	33	26	40	X	
97. How to check power steering and add fluid as per manufacturer's specifications for pick-up trucks	33	26	40	X	
98. How to inspect and adjust fan belts on pick-up trucks	40	26	33	X	
99. How to keep maintenance records on pick-up trucks	40	20	40	X	
100. How to check oil, water, tire pressure and battery periodically on pick-up trucks as per manufacturer's specifications	46	13	40	X	
101. How to operate pick-up trucks in a safe and careful manner	73	-	26	X	
102. Basic operating principles of pick-up trucks	46	-	53	X	
103. How to clean and wash pick-up trucks	26	13	60		X
104. The importance of checking gates after working hours	60	13	26	X	
105. How to clean and wash down workshop area	53	-	46	X	
106. How to operate vehicles in removing snow from specific site areas	26	13	60		X

VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
107. The importance of removing snow from specified areas on the site	40	26	33	X	
108. The use of various tools used for removing snow and ice from drainage pumps.	26	20	46		X
109. How to remove snow and ice from drainage pumps	33	20	46	X	
110. The importance of initiating or recommending new and improved practices	40	6	53	X	
111. How to initiate or recommend new and improved practices	40	6	46	X	
112. How to maintain shift log and record meter and gauge readings	66	6	26	X	
113. How to maintain effective communications and working relationships with other employees, government officials and the general public	53	13	33	X	
114. The importance of effective communications	66	6	26	X	
General Knowledges					
115. Safety procedures, warnings and notices on the site	86	-	13	X	
116. Basic operating principles of various power tools and the use of power and hand tools	66	-	33	X	
117. Reasons for properly storing power and hand tools	60	-	40	X	
118. The importance of identifying sources of supplies needed	33	20	46	X	
119. The importance of determining the amount of supplies needed	33	26	40	X	
120. How to determine needed supplies	33	20	46	X	
121. How to determine when to order supplies	33	26	40	X	
122. How to determine the quantity of supplies to purchase at a given time	33	33	33	X	
123. How to determine which supplies to order	33	20	46	X	
124. Basic cost comparisons	13	40	46		X
125. Basic Quality Comparisons	20	40	40		X
126. The reasons for wearing appropriate clothing and safety equipment for various tasks	73	-	26	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
127. Basic chemical content and their relationships	46	6	46	X	
128. Basic reasons for acquiring proper ventilation when working under various environmental conditions	80	-	20	X	
129. Primary uses of wood and metal preservatives	33	6	60	X	
130. Reasons for proper mixing and applying wood and metal preservatives	26	6	66		X
131. How to develop lists of materials needed for repairs	33	13	53	X	
132. How to determine various sources of parts	26	20	53		X
133. How to determine cost of repairs needed	13	20	66		X
134. How to order repair parts	26	6	66		X
135. How to clean and oil electric motors	53	-	46	X	
136. The importance of oiling electric motors	53	-	46	X	
137. How to replace fuses	53	6	40	X	
138. Basic functions of fuses	53	6	40	X	
139. How to replace electrical switches	46	-	53	X	
140. Basic functions of electrical switches	53	-	46	X	
141. How to wire simple electrical circuits	40	-	60	X	
142. Basic operating principles of electrical circuits	40	-	60	X	
143. How to install electrical motors	40	-	60	X	
144. Basic functions of circuit breakers and how to reset them	66	-	33	X	
145. How to repair broken electrical wires	46	-	53	X	
146. How to replace lighting fixtures	26	6	66		X
147. How to replace electric motor belts and pulleys	46	-	53	X	
148. How to cut weeds and grass around buildings with appropriate hand and power tools	40	6	53	X	
149. How to use basic pumping techniques	53	6	40	X	
150. How to replace faucets and pipes	33	-	66	X	
151. How to replace valves in the wastewater treatment system	46	-	53	X	
152. How to use basic glass replacement, puttying and caulking techniques	20	13	66		X

VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
153. Basic techniques in using the telephone	40	6	53	X	
154. How to use basic writing procedures and techniques	46	13	40	X	
155. How to use basic filing system procedures	40	6	46	X	
156. How to use different techniques in dealing with various groups of people	40	6	53	X	
157. The importance of ranking priorities in the total operation	46	20	33	X	
158. How to rank priorities based on needs	46	20	33	X	
159. How to plan work schedules for workers	26	40	33		X
160. Reasons for planning work	26	26	46		X
161. How to instruct workers in performing various jobs	26	33	40		X
162. How to evaluate workers	20	46	33		X
163. Reasons for evaluating worker's performance	20	46	33		X
164. How to identify work attitudes and the use of various means in dealing with each	20	40	40		X
165. How to assign specific responsibilities to workers	20	46	33		X
166. How to interview prospective workers	20	60	20		X
167. How to hire employees	20	60	20		X
168. Legal requirements in employing and dismissing employees	13	60	26		X
169. How to dismiss employees	20	60	20		X

[a]If 33 percent or more of the respondents indicated a knowledge was "essential", the job knowledge is to be accepted and included in the modules.

[b]If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Exhibits neatness in --					
1. Handling tools and equipment	66	-	33	X	
2. Keeping supplies in order	60	-	40	X	
3. The work area and office	60	-	40	X	
4. Grooming and dressing appropriately for work	46	6	46	X	
5. Setting examples for other employees in terms of working and other personal contacts in the work setting	53	-	46	X	
Shows dependability in --					
6. Completing work on time	73	-	26	X	
7. Arriving to work on time	86	-	13	X	
8. Coming back from "lunch" and "breaks" on time	86	-	13	X	
9. Reporting to the supervisor when there is a need to leave the work area or setting	80	-	20	X	
10. Comming to work regularly	100	-	-	X	
11. Following instructions and carrying out given tasks	93	-	6	X	
12. Reporting to supervisor abnormal situations in work setting	80	-	20	X	
13. Delegating appropriate responsibility to other employees and making sure the given tasks were performed properly	20	33	46		X
14. Accepting work setting problem reports and using appropriate supervisory techniques in correcting the problems reported	33	20	40	X	
15. Analyzing personnel problems and using viable supervisory means in solving problems	40	40	20	X	
16. Producing the best quality work	86	-	13	X	
17. Returning promptly all calls	66	6	26	X	
18. Being on time for appointments or calling ahead if detained	86	-	13	X	
19. Accepting and completing jobs assigned	93	-	6	X	
20. Being sure any reports or records are completed	66	-	33	X	
21. Being able to work with minimal supervision	80	-	20	X	
22. Being able to interpret and follow written and verbal directions	86	-	13	X	
23. Properly supervising other employees	33	26	40	X	
24. Anticipating need for and care of tools, equipment and supplies	73	-	26	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
25. Demonstrating a concern for safety practices	100	-	-	X	
26. Being sure reports are forwarded to the appropriate person	73	-	26	X	
27. Planning and organizing work load	33	13	53	X	
Behaves courteously toward --					
28. Fellow employees	80	-	20	X	
29. Superiors	86	-	13	X	
30. Subordinates	80	-	20	X	
31. Visitors	86	-	13	X	
Is willing to work --					
32. With details	60	-	40	X	
33. With complex problems	60	6	33	X	
34. With routine types of work	86	-	13	X	
35. With tools, machines and equipment	80	-	20	X	
36. With continuous job and work area change	66	-	33	X	
37. Under time pressure	60	-	40	X	
38. Under performance standard pressures	60	-	40	X	
39. On individual tasks for long periods of time	66	-	33	X	
40. On group tasks	80	-	20	X	
41. As a follower	73	-	26	X	
42. As a leader	60	6	33	X	
43. Under normal conditions	73	-	26	X	
44. Under abnormal conditions	66	-	33	X	
45. Things rather than people	53	6	33	X	
46. Performing preventive maintenance	86	-	13	X	
47. Using materials and supplies conservatively	80	-	20	X	
Confer with visitors in --					
48. Explaining the basic operation of equipment and systems when appropriate	66	-	33	X	
49. Explaining solution to problems when appropriate	60	13	26	X	
50. Locating various employees and site areas	66	20	13	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
51. Explaining the institution's policy	46	20	33	X	
Becoming involved in --					
52. Using telephone for personal purposes	6	80	6		X
53. Responding to letter inquires	40	26	33	X	
54. Handling information from files	40	20	40	X	
55. Releasing information concerning total operations	20	66	13		X
56. Improving ones scope of knowledge and ability	53	-	46	X	
57. Technical and professional local associations	13	20	66		X
58. Technical and professional state associations	13	20	66		X
59. Technical and professional national associations	13	40	46		X
60. Public relation activities	26	26	46		X
61. Employee relation activities	33	13	53	X	
62. Local, state and federal political activities	13	53	26		X
63. Continuing education and personal upgrading	53	-	46	X	
Displays --					
64. Leadership ability	20	-	80		X
65. Accuracy in working	66	-	33	X	
66. Efficient work habits	73	-	26	X	
67. Confidence in working	66	-	33	X	
68. Loyalty toward employer and/or firm	60	-	40	X	
69. Desire to maintain acceptable personal physical condition	53	-	46	X	
Demonstrate a concern for hazards in terms of --					
70. Safety and health of workers	86	-	13	X	
71. Safety to buildings and equipment	93	-	6	X	
72. Safety to the job	93	-	6	X	
73. Safety and health of visitors	80	-	20	X	
74. Company vehicles and demonstrates safe driving habits	46	-	13	X	

[a] If 33 percent or more of the respondents indicated a behavior was "essential", the behavior is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a behavior was "essential", the behavior is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
1. To be able to perform and apply simple mathematical functions: addition, subtraction, multiplication, division	93	-	6	X	
2. To have a basic understanding of algebra	26	13	60		X
3. To be able to read at a level commensurate with tasks performed	80	6	13	X	
4. To be able to read and comprehend statistical and written data	73	-	26	X	
5. To be able to write words and numbers legibly	100	-	-	X	
6. To have a good command of the English language	53	-	46	X	
7. To be able to perceive color properly. (Color blind test)	66	13	26	X	
8. Has dexterity adequate for the job	73	-	26	X	
9. To be able to speak pleasantly and courteously in person and on communication devices	66	-	33	X	
10. To be familiar with rules of grammar, spelling and punctuation	60	-	40	X	
11. To be able to use alphabetic and numeric systems	66	6	26	X	
12. To be able to practice good safety measures and use first aid when necessary	73	-	26	X	
13. To be able to use necessary hand power tools at a safe and productive level	86	-	20	X	
14. To be able to read and interpret drawings and specifications	60	6	33	X	
15. To be able to make drawings	33	20	46	X	
16. To be able to maintain information and cost records for reporting purposes	26	33	40		X
17. To be able to manipulate and assemble parts	80	-	20	X	
18. Has a mechanical aptitude that will allow understanding of basic principles	80	-	20	X	
19. Must be able to stand for long periods of time	33	33	33	X	
20. Has no physical impairments, such as serious back problems	53	20	26	X	
21. Must be able to run basic machine tools	53	13	33	X	
22. To have a basic understanding of trigonometry	20	60	20		X
23. To be able to use tools of electrical trade	20	6	73		X
24. To understand the use of all common electrical meters and testing devices	20	6	73		X
25. To be familiar with soldering	26	-	73		X

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
26. To understand electrical circuits	20	13	66		X
27. Knows Ohms Law and electrical theory	6	53	40		X
28. Knows AC and DC Current	26	-	73		X
29. To understand series and parallel circuits	20	26	53		X
30. To know relays, switches, transformers, capacitors, resistors, generators, batteries and magnetism	13	6	80		X
31. To understand the use of decimals in measuring tolerances and clearances	53	20	26	X	
32. To recognize degrees of rotation. (Example: 10 degrees)	33	13	53	X	
33. To understand and properly complete manufacturer's warranty claim forms	40	13	46	X	
34. Possesses good or corrected vision	66	-	33	X	
35. Possesses good or corrected hearing	66	-	33	X	
36. To have an understanding of basic physical sciences	40	6	53	X	
37. To be able to solve problems related to plane and solid geometry	20	46	6		X
38. To read and interpret common measurement devices, using feet, inches, pounds, ounces, unit rotation	53	-	46	X	
39. To interpolate and extrapolate measurement values	46	40	13	X	
40. To estimate and approximate measurements	40	-	60	X	
41. To convert from one unit to another	53	-	46	X	
42. To measure using conventional unit notation: linear (length-distance), weight (ounces-pounds), size (area), and volume (cubic)	60	6	33	X	
43. To read, interpret, and use size-scale relationships	46	13	40	X	
44. To record measurements using appropriate unit notation	53	6	40	X	
45. To read and interpret basic graph relationships	53	6	40	X	
46. To measure, compute, and estimate perimeter, area and volume	46	20	33	X	
47. To read and interpret coefficient measurements	40	40	20	X	
48. To read and interpret building trades measurements, specifications, indicated in table form	40	26	33	X	
49. To read and interpret board feet measurements	26	33	40		X

VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
50. To read and interpret carpenter's rules and measurement tapes	33	13	53	X	
51. To read and interpret building codes	20	60	20		X
52. To read and interpret building permits, and licenses, the forming square, mechanical drawing relationships, and orthographic projection views	20	60	20		X
53. To be able to discriminate between two-dimensional and three-dimensional patterns and objects	33	26	33	X	
54. To demonstrate eye-hand coordination	46	-	46	X	
55. To work of move readily about an elevated frame or structure, with no fear of height	20	20	60		X
56. Maintain balance readily, is physically agile	40	6	53	X	
57. Has physical strength and stamina needed to pursue exhausting work	40	20	40	X	
58. Knows building trades vocabulary	13	33	53		X
59. To be able to use necessary hand tools at a safe and productive level	60	-	40	X	
60. To be able to read at a level sufficient to understand and follow directions in equipment manuals and code books	60	-	40	X	
61. To be able to read at a level to interpret labels, directions on labels, and specifications in equipment manuals	66	6	26	X	
62. To understand electrical circuits used on control systems	26	20	53		X
63. To measure accurately to 0.01 inches	33	20	46	X	
64. To understand basic operation of physical plant	66	-	33	X	
65. To able to record drawings	33	33	33	X	
66. To operate a ten-key adding machines by the "touch system"	13	80	6		X
67. To be able to lift heavy objects	26	13	60		X
68. To be able to compare names and numbers accurately and quickly	26	13	60		X
69. Know vocabulary of related industry	53	26	20	X	
70. To be able to use the alphabetic and numeric systems when filing	26	20	53		X
71. To have a basic knowledge of geometry	20	46	33		X
72. To be able to write a clear and to the point letter	33	26	40	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
73. To be able to read and understand a county map	33	13	53	X	
74. Is able to measure length to ¼ of and inch	60	-	40	X	
75. Is able to measure length to 1/8 of an inch	60	-	40	X	
76. Is able to measure length to 1/16 of an inch	60	-	40	X	
77. Is able to measure to 1/32 of an inch	60	-	40	X	
78. Is able to measure temperature to 1°F.	73	6	20	X	
79. Is able to measure volume by pints	66	6	26	X	
80. Is able to measure volume by quarts	66	6	26	X	
81. Is able to measure volume by gallons	66	6	26	X	
82. Is able to measure using a micrometer to .020"	40	13	46	X	
83. Is able to measure using a micrometer to .010"	40	13	46	X	
84. Is able to measure using a micrometer to .002"	40	20	40	X	
85. Is able to maintain a log of time and duration of stay on a job	60	-	40	X	
86. Is able to enter cost of items in columns and total them	46	13	40	X	
87. Is able to determine sales tax	20	46	33		X
88. Is able to determine time on a job and determine customer labor	26	33	40		X
89. Is able to transfer number sequences from a source to a column	53	20	26	X	
90. Is able to add columns of numbers	73	6	20	X	
91. Is able to understand money denominations	46	13	40	X	
92. Is able to make change	40	40	20	X	
93. To be able to lift heavy object; minimum of 75 pounds	40	20	40	X	
94. To read and interpret common mesaurement devices using feet	60	-	40	X	
95. To read and interpret common measurement devices using inches	60	-	40	X	
96. to read and interpret common measurement devices using pounds	60	-	40	X	
97. To read and interpret common measurement devices using ounces	60	-	40	X	
98. To read and interpret common measurement devices using unit notation	46	13	33	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
99. To measure using conventional unit notation: linear (length-distance)	66	-	33	X	
100. To measure using conventional unit notation: weight (ounces-pounds)	66	-	33	X	
101. To measure using conventional unit notation: size (area)	60	6	33	X	
102. To measure using conventional unit notation: volume (cubic)	60	6	33	X	

[a] If 33 percent or more of the respondents indicated a basic skill was "essential", the skill is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a basic skill was "essential", the skill is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

TASK ANALYSIS RESULTS FOR WASTEWATER TREATMENT LABORATORY TECHNICIAN

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES				TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Performing General Laboratory Skills							
1. Using safety practices while working in a laboratory	93	--	--	6	26	66	45.2
2. Selecting sampling devices	46	13	20	26	20	13	27.6
3. Using personal hygiene in collecting samples	86	--	--	46	33	20	37.0
4. Using protective clothing in collecting samples	66	6	20	33	26	13	31.4
5. Collecting representative samples of influents and effluents	73	--	20	26	26	26	35.2
6. Collecting representative samples of monitoring wells and receiving waters	60	6	26	26	26	13	30.5
7. Compositing and preserving samples as required by local, state and federal laws	80	6	6	20	40	26	36.8
8. Preparing samples for various laboratory tests	73	6	6	20	40	26	36.8
9. Using the microscope	60	13	20	53	6	13	30.1
10. Recording laboratory test results	80	6	--	6	26	53	39.3
11. Washing and cleaning laboratory equipment	100	--	6	13	33	46	41.3
12. Polishing broken reusable equipment with a flame	33[c]	20	60	13	--	6	20.9
13. Sterilizing laboratory equipment	80	6	20	13	33	33	38.2
14. Sweeping and washing laboratory	60	13	26	40	6	6	23.9
15. Labeling chemicals and bottles clearly and storing in appropriate areas	86	--	--	6	53	40	43.0

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Testing for Physical Characteristics of:							
16. Temperature	93	--	6	13	13	60	40.3
17. Turbidity	86	6	--	20	26	40	37.0
18. Color	80	6	6	20	33	33	37.5
19. Dissolved Oxygen	86	6	--	20	20	46	37.6
20. Conductivity	86	6	6	26	20	40	37.6
21. pH	93	6	--	20	20	46	37.6
Testing for Organic Characteristics of:							
22. Biochemical Oxygen Demand	73	6	--	20	46	26	38.0
23. Total Organic Carbon	46	13	6	46	33	--	29.5
24. Chemical Oxygen Demand	60	6	--	33	46	13	35.4
25. Total Nitrogen	53	6	6	40	33	13	33.5
26. Total Phosphorus	60	6	6	33	33	20	34.9
Testing for Chemical Parameters of:							
27. Chloride	46	6	--	60	26	6	32.0
28. Ammonia Nitrogen	53	6	--	46	33	13	34.1
29. Nitrate Nitrogen	60	6	--	46	33	13	34.1
30. Aluminum	26[c]	6	20	53	20	--	28.5
31. Copper	26[c]	6	20	53	20	--	28.5
32. Manganese	33[c]	6	20	53	20	--	28.5
33. Zinc	33[c]	6	13	60	20	--	29.2
34. Magnesium	26[c]	6	13	60	20	--	29.2
35. Potassium	26[c]	6	13	53	26	--	29.5
36. Mercury	33[c]	6	13	53	20	--	27.1

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
37. Sulfate	53	6	20	46	20	--	26.4
38. Nitrate Nitrogen	73	6	6	40	33	6	30.0
39. Soluble Ortho Phosphates	60	6	6	60	13	6	28.0
40. Cadmium	20[c]	6	13	60	6	--	23.6
41. Lead	33[c]	6	13	60	13	--	26.4
42. Nickel	26[c]	6	26	46	13	--	24.8
43. Calcium	33[c]	6	13	60	13	--	26.4
44. Sodium	33[c]	6	13	60	13	--	26.4
45. Iron	33[c]	6	20	53	13	--	25.7
46. Chromium	26[c]	6	20	46	20	--	26.4
Testing for Solids of:							
47. Total Solids	80	6	6	33	20	33	36.2
48. Total Volatile Solids	80	6	6	33	20	33	36.2
49. Suspended Solids	80	6	6	33	13	40	36.9
Testing for Bacteriological Parameters of:							
50. Fecal Coliform	53	6	6	33	20	33	36.2
51. Fecal Streptococcus	46	6	6	40	26	20	34.2
Testing for Chemical Quality of:							
52. Alkyl Benzene Solfanates (ABS)	20[c]	33	6	40	6	6	21.9
53. Arsenic	13[c]	26	6	46	13	6	25.8
54. Barium	13[c]	26	6	46	13	6	25.8
55. Cadmium	20[c]	20	6	53	13	6	27.3
56. Chlorides	66	13	--	46	33	6	31.3

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
57. Chromium	40	13	--	60	20	6	30.3
58. Copper	40	20	--	53	20	6	28.9
59. Cyanide	26[c]	26	6	46	13	6	25.8
60. Iron	40	20	--	53	20	6	28.9
61. Lead	26[c]	26	6	40	20	6	26.8
62. Manganese	26[c]	20	6	46	20	6	28.0
63. Mercury	26[c]	20	6	53	13	6	27.3
64. Nitrate Nitrogen	73	6	--	46	40	6	33.4
65. Organics	46	13	--	53	26	6	30.6
66. Carbon Chloroform Extractables	13[c]	40	6	40	6	6	22.6
67. Selenium	13[c]	40	6	33	13	6	23.3
68. Silver	13[c]	33	6	40	13	6	24.7
69. Sodium	40	20	--	53	20	6	28.9
70. Sulfates	46	13	--	53	26	6	30.6
71. Zinc	40	20	--	53	20	6	28.9
72. Phenols	13[c]	26	6	53	6	6	25.1
73. Total Dissolved Solids	73	6	6	46	26	13	32.5
Testing for Organophosphate and Carbamate Insecticides of:							
74. Toxaphene	13[c]	40	20	26	6	6	21.2
75. 2, 4, -D	13[c]	40	20	26	6	6	21.2
76. 2, 4, 5-T	13[c]	40	20	26	6	6	21.2
77. 2, 4, 5-TP (Silvex)	13[c]	40	20	26	6	6	21.2

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Testing for Physical Quality of:							
78. Taste	33[c]	33	6	26	13	13	24.0
79. Odor	53	20	6	20	13	33	30.9
Testing for Radioactivity of:							
80. Alpha Activity	6[c]	46	13	20	6	--	15.6
81. Beta Activity	6[c]	46	13	20	6	--	15.6
Testing for Bacteriology of:							
82. Total Coliform	60	6	--	26	20	40	36.4
Testing for Pesticides of:							
83. Aldrin	13[c]	46	--	33	13	--	19.7
84. Dieldrin	13[c]	46	--	33	13	--	19.7
85. Chlorodane	13[c]	46	--	33	13	--	19.7
86. DDT	13[c]	46	--	33	13	--	19.7
87. Endrin	13[c]	46	--	33	13	--	19.7
88. Heptachlor	13[c]	47	6	26	13	--	18.8
89. Heptachlor epoxide	13[c]	46	6	26	13	--	18.8
90. Lindane	13[c]	46	6	26	13	--	18.8
91. Methoxychlor	13[c]	46	6	26	13	--	18.8

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=15)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Performing Common Skills in Conducting Laboratory Tests:							
92. Using the appropriate apparatus, reagents, procedures, precautions, calculations and record keeping for the various tests	86	6	--	13	13	66	42.7

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

[c] If less than 40 percent of the respondents declared that the skill was not needed for job entry, the skill is to be reviewed by module developers in order to determine whether such information should be included in modules of instruction.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Performing General Laboratory Skills:					
1. Safety precautions and procedures necessary to work in a laboratory	86	--	13	X	
2. Major dangers to the laboratory technician	66	--	33	X	
3. First aid techniques necessary to care for minor laboratory accidents	53	--	46	X	
4. The importance of properly handling hazardous materials	86	--	13	X	
5. The reactions when acid is added to water	80	--	20	X	
6. Fire regulations regarding storage of explosive or inflammable materials	40	--	60	X	
7. Reasons for using different types of sampling devices	20	20	60		X
8. The importance of personal hygiene for wastewater treatment personnel	46	--	53	X	
9. The types of soaps and/or other chemicals that will give safe protection	13	--	86		X
10. The importance of wearing protective clothing during the collection of a sample	13	13	73		X
11. Procedures for collecting a sample	46	--	53	X	
12. The importance of a representative sample	40	--	60	X	
13. Reasons for selecting an appropriate sampling location	26	6	66		X
14. The importance of taking a sample at a representative time	13	6	80		X
15. The use of monitoring wells	--	20	80		X
16. Effects of effluent on ecology	20	13	66		X
17. Reasons for compositing representative samples	20	13	66		X
18. State and local laws regarding sampling requirements	13	20	66		X
19. How to preserve composited samples	26	6	66		X
20. Reasons for preparing samples before testing	40	6	53	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
21. How to operate the microscope	13	13	73		X
22. How to record test results	60	6	33	X	
23. Reasons laboratory equipment must be clean	60	--	40	X	
24. Procedure for cleaning laboratory equipment	66	--	33	X	
25. Procedure for flame polishing glass	6	46	46		X
26. Procedures used in sterilizing laboratory equipment	46	--	53	X	
27. Basic operating principles of a sterilizer	33	13	53	X	
28. Procedures in sweeping and washing laboratory	13	20	66		X
29. Importance of proper labeling in the laboratory	100	--	--	X	
30. How to label bottles and chemicals clearly	93	--	6	X	
31. Proper storage procedures for various chemicals	73	--	26	X	
How to Test for Physical Characteristics of:					
32. Temperature	66	--	33	X	
33. Turbidity	40	6	53	X	
34. Color	33	6	60	X	
35. Dissolved oxygen	66	6	26	X	
36. Conductivity	40	6	53	X	
37. pH	73	6	20	X	
How to Test for Organic Characteristics of:					
38. Biochemical oxygen demand	73	6	20	X	
39. Total organic carbon	6	13	80		X
40. Chemical oxygen demand	60	13	26	X	
42. Total phosphorous	46	13	40	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
How to Test for the Chemical Parameters of:					
43. Chloride	26	20	53		X
44. Ammonia nitrogen	53	26	20	X	
45. Nitrite nitrogen	60	20	20	X	
46. Aluminum	13	33	53		X
47. Cooper	20	33	46		X
48. Manganese	13	26	60		X
49. Zinc	20	26	53		X
50. Magnesium	20	20	60		X
51. Potassium	26	20	53		X
52. Mercury	6	20	73		X
53. Sulfate	33	26	40	X	
54. Nitrate nitrogen	60	20	20	X	
55. Soluble ortho phosphates	46	20	33	X	
56. Cadmium	6	40	53		X
57. Lead	13	40	46		X
58. Nickel	6	46	46		X
59. Calcium	13	26	60		X
60. Sodium	13	26	60		X
61. Iron	13	26	60		X
62. Chromium	6	40	53		X
How to Test for Solids:					
63. Total solids	60	13	26	X	
64. Total volative solids	60	13	26	X	
65. Suspended solids	60	13	26	X	
How to Test for the Bacteriological Parameters:					
66. Fecal coliform	53	20	26	X	
67. Fecal stroptococcus	40	20	40	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
How to Test for the Chemical Quality of:					
68. Alkyl Benzene Sulfonates (ABS)	--	53	40		X
69. Arsenic	--	40	53		X
70. Barium	--	46	46		X
71. Cadmium	6	40	46		X
72. Chlorides	33	33	26	X	
73. Chromium	6	40	46		X
74. Copper	6	33	53		X
75. Cyanide	6	46	40		X
76. Iron	6	26	60		X
77. Lead	6	33	53		X
78. Manganese	6	26	60		X
79. Mercury	--	26	66		X
80. Nitrate Nitrogen	40	20	33	X	
81. Organics	13	40	40		X
82. Carbon Chloroform Extractables (CCE)	--	46	46		X
83. Selenium	--	60	33		X
84. Silver	--	53	40		X
85. Sodium	13	26	53		X
86. Sulfate	20	26	46		X
87. Zinc	6	26	60		X
88. Phenols	--	46	46		X
89. Total dissolved solids	33	26	33	X	
How to Test for Organophosphate and Carbamate Insecticides of:					
90. Toxaphene	--	66	26		X
91. 2, 4, -D	--	60	33		X
92. 2, 4, 5 - T	--	66	26		X
93. 2, 4, 5 - TP (Silvex)	--	60	33		X

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VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
How to Test for the Physical Quality of:					
94. Taste	20	33	46		X
95. Odor	40	26	33	X	
How to Test for Radioactivity of:					
96. Alpha Activity	--	73	20		X
97. Beta Activity	--	73	20		X
How to Test for Bacteriology of:					
98. Total coliform	40	20	40	X	
How to Test for the Pesticides of:					
99. Aldrin	--	60	33		X
100. Dieldrin	--	66	26		X
101. Chlorodane	--	60	33		X
102. DDT	--	60	33		X
103. Endrin	--	66	26		X
104. Heptachlor	--	66	26		X
105. Heptachlor epoxide	--	66	26		X
106. Lindane	--	66	26		X
107. Methoxychlor	--	60	33		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Common Skills in Performing Laboratory Tests:					
108. Use of various apparatus necessary to perform the tests	73	6	20	X	
109. Use of various reagents necessary to perform the tests	73	7	20	X	
110. Procedures to follow for each test	66	6	26	X	
111. Precautions to follow in conducting each test	66	6	26	X	
112. How to make the necessary calculations for each test	46	6	46	X	
113. How to record the results of each test	60	6	33	X	

[a] If 33 percent or more of the respondents indicated a knowledge was "essential", the job knowledge is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Exhibits neatness in --					
1. Handling tools and equipment	66	—	33	X	
2. Keeping supplies in order	46	6	46	X	
3. The work area and office	33	—	66	X	
4. Grooming and dressing appropriately for work	13	13	73		X
5. Setting examples for other employees in terms of working and other personal contacts in the work setting	33	6	60	X	
Shows dependability in --					
6. Completing work on time	53	--	46	X	
7. Arriving to work on time	53	--	46	X	
8. Coming from "lunch" and "breaks" on time	33	6	60	X	
9. Reporting to the supervisor when there is a need to leave the work area or setting	53	20	26	X	
10. Coming to work regularly	73	--	26	X	
11. Following instructions and carrying out given tasks	86	--	13	X	
12. Reporting to supervisor abnormal situations in the work setting	80	--	20	X	
13. Delegating appropriate responsibility to other employees and making sure the given tasks were performed properly	33	26	40	X	
14. Accepting work setting problem reports and using appropriate supervisory techniques in correcting the problems reported	13	40	46		X
15. Analyzing personnel problems and using viable supervisory means in solving problems	20	40	40		X
16. Producing the best quality work	66	--	33	X	
17. Returning promptly all calls	33	6	60	X	
18. Being on time for appointments or calling ahead if detained	33	6	60	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
19. Accepting and completing jobs assigned	73	--	26	X	
20. Being sure any reports or records are completed	66	--	33	X	
21. Being able to work with minimal supervision	86	--	13	X	
22. Being able to interpret and follow written and verbal directions	80	--	20	X	
23. Properly supervising other employees	13	46	40		X
24. Anticipating need for and care of tools, equipment and supplies	33	--	66	X	
25. Demonstrating a concern for safety practices	80	--	20	X	
26. Being sure reports are forwarded to the appropriate person	53	--	46	X	
27. Planning and organizing work load	26	--	73		X
Behaves courteously toward --					
28. Fellow employees	66	--	33	X	
29. Superiors	53	--	46	X	
30. Subordinates	53	--	46	X	
31. Visitors	46	--	53	X	
Is willing to work --					
32. With details	53	13	33	X	
33. With complex problems	20	13	66		X
34. With routine types of work	86	--	13	X	
35. With tools, machines and equipment	40	6	53	X	
36. With continuous job and work area change	6	26	66		X
37. Under time pressure	26	26	46		X
38. Under performance standard pressures	46	13	40	X	
39. On individual tasks for long periods of time	46	6	46	X	

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VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
40. On group tasks	26	13	60		X
41. As a follower	60	--	40	X	
42. As a leader	20	33	46		X
43. Under normal conditions	60	--	40	X	
44. Under abnormal conditions	20	6	73		X
45. Things rather than people	40	26	33	X	
46. Performing preventive maintenance	26	--	73		X
47. Using materials and supplies conservatively	33	--	66	X	
Confer with visitors in --					
48. Explaining the basic operation of equipment and systems when appropriate	13	--	86		X
49. Explaining solution to problems when appropriate	6	6	86		X
50. Locating various employees and site areas	13	13	73		X
51. Explaining the institution's policy	6	26	66		X
Becoming involved in --					
52. Using telephone for personal purposes	--	73	26		X
53. Responding to letter inquiries	6	46	46		X
54. Handling information from files	26	26	46		X
55. Releasing information concerning total operations	13	66	13		X
56. Improving ones scope of knowledge and ability	46	6	46	X	
57. Technical and professional local associations	6	40	53		X
58. Technical and professional state associations	6	40	53		X
59. Technical and professional national associations	6	46	46		X
60. Public relation activities	6	53	40		X
61. Employee relation activities	6	33	60		X
62. Local, state and federal political activities	--	66	33		X
63. Continuing education and personal upgrading	20	--	80		X

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VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Displays --					
64. Leadership ability	--	33	66		X
65. Accuracy in working	66	--	33	X	
66. Efficient work habits	66	--	33	X	
67. Confidence in working	60	--	40	X	
68. Loyalty toward employer and/or firm	40	13	46	X	
69. Desire to maintain acceptable personal physical condition	26	6	66		X
Demonstrates a concern for hazards in terms of --					
70. Safety and health of workers	80	--	20	X	
71. Safety to buildings and equipment	66	--	33	X	
72. Safety to the job	66	--	33	X	
73. Safety and health of visitors	60	--	40	X	
Demonstrates respect for --					
74. Company vehicles and demonstrates safe driving habits	53	--	46	X	

[a] If 33 percent or more of the respondents indicated a behavior was "essential", the behavior is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a behavior was "essential", the behavior is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
1. To be able to perform and apply simple mathematical functions: addition, subtraction, multiplication, division	86	--	13	X	
2. To have a basic understanding of algebra	26	6	66		X
3. To be able to read at a level commensurate with tasks performed	86	--	13	X	
4. To be able to read and comprehend statistical and written data	33	13	53	X	
5. To be able to write words and numbers legibly	73	--	26	X	
6. To have a good command of the English language	33	6	60	X	
7. To be able to perceive color properly. (color blind test)	40	6	53	X	
8. Has dexterity adequate for the job	80	--	20	X	
9. To be able to speak pleasantly and courteously in person and on communication devices	33	13	53	X	
10. To be familiar with rules and grammar, spelling and punctuation	6	20	73		X
11. To be able to use alphabetic and numeric systems	60	--	40	X	
12. To be able to practice good safety measures and use first aid when necessary	66	--	33	X	
13. To be able to use necessary hand power tools at a safe and productive level	20	26	53		X
14. To be able to read and interpret drawings and specifications	13	33	53		X
15. To be able to make drawings	--	40	60		X
16. To be able to maintain information and cost records for reporting purposes	6	33	60		X
17. To be able to manipulate and assemble parts	20	13	66		X
18. Has a mechanical aptitude that will allow understanding of basic principles	26	13	60		X
19. Must be able to stand for long periods of time	13	40	46		X
20. Has no physical impairments, such as serious back problems	26	33	40		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
21. Must be able to run basic machine tools	--	53	46		X
22. To have a basic understanding of trigonometry	--	60	40		X
23. To be able to use tools of electrical trade	--	46	53		X
24. To understand the use of all common electrical meters and testing devices	6	46	46		X
25. To be familiar with soldering	--	60	40		X
26. To understand electrical circuits	--	53	46		X
27. Knows Ohms Law and electrical theory	--	66	33		X
28. Knows AC and DC current	13	46	40		X
29. To understand series and parallel circuits	6	60	33		X
30. To know relays, switches, transformers, capacitors, resistors, generators, batteries and magnetism	--	66	33		X
31. To understand the use of decimals in measuring tolerances and clearances	6	40	53		X
32. To recognize degrees of rotation. (example: 10 degrees)	6	46	46		X
33. To understand and properly complete manufacturer's warranty claim forms	20	40	40		X
34. Possesses good or corrected vision	60	6	33	X	
35. Possesses good or corrected hearing	46	6	46	X	
36. To have an understanding of basic physical sciences	33	33	33	X	
37. To be able to solve problems related to plane and solid geometry	--	13	33		X
38. To read and interpret common measurement devices, using feet, inches, pounds, ounces, unit rotation	46	6	46	X	
39. To interpolate and extrapolate measurement values	26	33	40		X
40. To estimate and approximate measurements	33	20	46	X	
41. To convert from one unit to another	46	6	40	X	
42. To measure using conventional unit notation: linear (length-distance), weight (ounces-pounds), size (area) and volume (cubic)	53	13	33	X	
43. To read, interpret, and use size-scale relationships	33	33	33	X	
44. To record measurements using appropriate unit notation	60	6	33	X	
45. To read and interpret basic graph relations	40	13	46	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
46. To measure, compute and estimate perimeter, areas and volumes	26	33	40		X
47. To read and interpret coefficient measurements	6	33	60		X
48. To read and interpret building trades measurements, specifications, indicated in table form	--	73	26		X
49. To read and interpret board feet measurements	--	93	6		X
50. To read and interpret carpenter's rules and measurements tapes	--	86	13		X
51. To read and interpret building codes	--	93	6		X
52. To read and interpret building permits, and licenses, the forming square, mechanical drawing relationships, and orthographic projection views	--	86	13		X
53. To be able to discriminate between two-dimensional and three-dimensional patterns and objects	6	60	33		X
54. To demonstrate eye-hand coordination	33	13	53	X	
55. To work or move readily about an elevated frame or structure with no fear of height	6	80	13		X
56. Maintain balance readily, is physically agile	13	13	73		X
57. has physical strength and stamina needed to pursue exhausting work	--	46	53		X
58. Knows building trades vocabulary	--	93	6		X
59. To be able to use necessary hand tools at a safe and productive level	6	53	40		X
60. To be able to read at a level sufficient to understand and follow directions in equipment manuals and code books	46	6	46	X	
61. To be able to read at a level to interpret labels, directions on labels, and specifications in equipment manuals	60	6	33	X	
62. To understand electrical circuits used on control systems	--	53	46	X	
63. To measure accurately to 0.01 inches	6	53	40	X	
64. To understand basic operation of physical plant	26	40	33		X
65. To be able to record drawings	--	60	40		X
66. To operate a ten-key adding machine by the "touch system"	--	60	40		X

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
67. To be able to lift heavy objects	6	53	40		X
68. To be able to compare names and numbers accurately and quickly	13	20	66		X
69. Knows vocabulary of related industry	33	13	53	X	
70. To be able to use the alphabetic and numeric systems when filing	6	13	80		X
71. To have a basic knowledge of geometry	6	46	46		X
72. To be able to write a clear and to the point letter	6	33	60		X
73. To be able to read and understand a county map	20	40	40		X
74. Is able to measure length to 1/4 of an inch	20	33	46		X
75. Is able to measure length to 1/8 of an inch	20	33	46		X
76. Is able to measure length to 1/16 of an inch	20	33	46		X
77. Is able to measure length to 1/32 of an inch	20	40	40		X
78. Is able to measure temperature to 1°F	53	6	40	X	
79. Is able to measure volume by pints	40	33	26	X	
80. Is able to measure volume by quarts	40	33	26	X	
81. Is able to measure volume by gallons	40	33	26	X	
82. Is able to measure using a micrometer to .020"	--	66	33		X
83. Is able to measure using a micrometer to .010"	--	66	33		X
84. Is able to measure using a micrometer to .002"	6	66	26		X
85. Is able to maintain a log of time and duration of stay on a job	26	26	46		X
86. Is able to enter cost of items in columns and total them	6	46	46		X
87. Is able to determine sales tax	--	73	26		X
88. Is able to determine time on a job and determine customer labor	13	53	33		X
89. Is able to transfer number sequences from a source to a column	46	20	33	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: WASTEWATER TREATMENT LABORATORY TECHNICIAN

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
90. Is able to add columns of numbers	60	20	20	X	
91. Is able to understand money denominations	20	33	46		X
92. Is able to make change	13	53	33		X
93. To be able to lift heavy object; minimum of 75 pounds	20	53	26		X
94. To read and interpret common measurement devices using feet	26	13	60		X
95. To read and interpret common measurement devices using inches	33	13	53	X	
96. To read and interpret common measurement devices using pounds	26	13	60		X
97. To read and interpret common measurement devices using ounces	26	20	53		X
98. To read and interpret common measurement devices using unit notation	6	33	60		X
99. To measure using conventional unit notation: linear (length-distance)	33	20	46	X	
100. To measure using conventional unit notation: weight (ounces-pounds)	33	20	46	X	
101. To measure using conventional unit notation: size (area)	33	20	46	X	
102. To measure using conventional unit notation: volume (cubic)	33	6	53	X	

[a] If 33 percent or more of the respondents indicated a skill was "essential", the skill is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a skill was "essential", the skill is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

TASK ANALYSIS RESULTS FOR AGRICULTURAL EQUIPMENT MECHANIC

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Farm Power							
1. Identify diesel fueled internal combustion engine	100	-	-	7	21	71	46.0
2. Identify gasoline fueled internal combustion engine	100	-	-	-	28	71	46.7
3. Identify 4-stroke cycle engine	85	-	-	21	14	57	40.4
4. Identify 2-stroke cycle engine	92	-	-	28	21	42	37.8
5. Check & clean (or replace) the filters in the fuel line of a gasoline fueled engine	100	-	-	14	57	28	41.0
6. Clean the carburetor of a gasoline fueled engine	78	7	7	21	42	21	35.7
7. Adjust the carburetor of a gasoline fueled engine	92	-	7	7	57	28	40.3
Tools							
8. Identify hand & power tools commonly used for repairing farm equipment	92	-	-	14	35	50	43.2
9. Correctly use hand & power tools commonly used in repairing farm equipment	92	-	-	35	35	28	38.5
10. Observe & follow safety practices when working in the farm machinery repair shop	100	-	-	-	28	71	46.7
11. Set & adjust the controls on the oxy-acetylene welding equipment commonly found in the farm repair shop & for the kind of job to be done	71	-	21	21	42	14	34.3
12. Set & adjust the controls on the arc welding equipment commonly found in the farm repair shop & for the kind of job to be done	71	-	21	35	28	14	32.9

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
13. Select appropriate welding rods for the kind of job to be done	64	-	21	35	28	7	29.4
14. Prepare metal for welding	71	-	21	28	28	14	30.8
15. Perform the kind and/or position of welds commonly needed for repairing farm equipment	64	-	21	28	28	14	30.8
16. Strike an arc with various types of current	50	7	28	7	42	7	28.7
17. Shut down welding machine	50	7	14	21	28	14	28.0
18. Set the current for various types of metals; (a) alternating current, (b) straight polarity, (c) reverse polarity	64	-	14	35	35	7	30.8
19. Read charts for setting equipment	71	-	21	28	28	21	34.3
20. Select correct size & shape of electrode for DSCP, DCRP, & AC current	35	7	21	28	14	14	25.9
21. Set amperage for welding various thicknesses of metal	71	7	14	21	42	14	33.6
22. Set the feed for feeding the wire into the arc	42	14	14	35	7	14	24.5
23. Set the machine for arc cutting	57	14	7	42	7	21	28.7
24. Set the flame of the oxy-acetylene welder	71	-	14	21	42	14	32.9
25. Set the regulator of the oxy-acetylene welder: (a) correct air pressure & (b) correct gas pressure	78	-	14	28	42	14	35.0
26. Select correct torch tip for the job	71	-	14	28	50	7	34.7
27. Properly light the torch	85	-	14	35	42	7	33.6
28. Use the torch with correct positions & movements	64	-	14	28	35	14	32.2

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
29. Adjust oxy-acetylene flames for cutting metal	92	-	7	21	28	42	39.9
30. Accurately flame cut thin & thick steel sections	78	-	7	35	28	28	37.1
31. Adjust air & gas line on the regulator	78	-	7	35	28	21	33.6
32. Select correct cutting torch for cutting various metal sizes	64	-	28	7	35	28	35.7
33. Use cutting attachments for changing a welding torch to a cutting torch	71	-	14	21	42	21	36.4
34. Clean cutting tips	57	-	21	28	28	21	34.3
35. Use torch guides & mechanical guides	50	-	14	42	14	21	31.5
36. Select nozzle size for the job	78	7	7	42	21	21	33.6
37. Set inert gas for welding	50	7	28	14	14	28	30.1
38. Set the water valve if torch is water cooled	50	14	21	14	14	28	29.4
39. Read the flow meter & understand CFH units of flow	50	14	21	21	14	21	28.0
40. Select the best gas for the job	50	7	28	21	7	28	29.4
41. Correctly add welding rod metal to the weld	64	-	21	21	28	21	32.2
42. Use clamps & clamping fixtures	85	-	21	21	21	35	36.4
43. Cut metal (bevels, rivets, holes)	71	-	14	21	35	28	37.1
44. Prepare joints for welding	85	-	7	21	35	28	35.7
45. Weld in horizontal, vertical & over-head positions	71	-	14	28	28	28	36.4
46. Weld pipe	50	-	14	35	35	14	34.3

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VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Battery & Ignition							
47. Check, clean, or replace spark plugs	92	-	-	14	42	42	42.0
48. Check, clean, or replace distributor points or condensor	92	-	-	7	50	42	43.1
49. Check or replace coil	78	-	14	7	28	42	37.1
50. Check specific gravity of electrolyte & temperature compensate in the reading	71	-	7	28	28	35	38.5
51. Perform a visual inspection of battery conditions	85	-	-	35	42	21	37.8
52. Install a battery	92	-	7	-	42	50	43.2
53. Clean battery terminals	92	-	7	7	50	35	41.0
54. Check charging system operation	85	-	7	35	42	14	35.7
55. Connect booster cables properly	100	-	-	-	42	64	48.8
56. Activate new dry-charged batteries	85	-	7	-	50	28	35.4
57. Charge batteries according to specifications	78	-	-	21	50	28	40.3
58. Check & set ignition timing	85	-	-	14	50	28	38.2
59. Inspect, replace, & adjust headlights & bulbs	71	-	14	14	28	35	35.7
60. Check and/or replace fuses	78	-	14	28	21	35	37.1
61. Check fluid level of battery cells & restore to proper level	85	-	7	21	28	42	39.9
62. Connect the generator-regulator tester into charging system	64	-	7	35	35	14	32.9
63. Locate wiring diagram in Service Manual & trace out circuits	78	-	-	42	35	21	37.1
64. Perform a generator output test	57	-	-	42	28	21	34.3
65. Check voltage limiter setting & adjust	35	-	14	42	35	-	29.4

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
66. Check the current regulator setting & adjust	50	7	14	35	28	7	28.7
67. Check the cut-out relay operation & adjust	64	7	14	28	42	-	28.7
68. Test for voltage drop in the charging circuit	57	7	14	28	35	7	29.4
69. Repair & replace generator for service	92	7	-	42	35	14	34.3
70. Adjust belt tension	92	-	-	21	50	28	40.3
71. Visually inspect generator/regulator & connecting wiring	85	7	-	21	35	35	38.5
72. Disassemble & inspect generator	78	7	-	21	42	21	34.3
73. Check armature for shorts, opens, & grounds	57	7	7	21	35	21	32.9
74. Check field coils for shorts, opens & grounds	64	7	7	21	42	14	32.2
75. Inspect & replace generator bearings	57	7	21	7	42	14	30.8
76. Replace generator brushes	71	7	7	21	42	14	32.2
77. Turn armature commutator on the lathe	35	7	28	28	21	7	26.6
78. Undercut commutator mica-separators	28	14	14	28	28	7	27.3
79. Assemble & polarize the generator	50	7	21	14	42	7	29.4
80. Polarize generator field coils	57	7	14	14	57	-	30.5
81. Perform an alternator output test	50	7	14	28	35	7	29.4
82. Check field relay operation	35	7	21	21	35	7	28.7
83. Check voltage limiter setting	35	7	21	14	42	7	29.4
84. Repair and/or replace alternator for service	50	7	-	42	21	21	32.2
85. Visually inspect alternator, regulator & connecting wiring	85	7	-	28	42	21	36.4
86. Disassemble & inspect alternator	35	7	21	21	21	21	30.1
87. Test rotor for opens, shorts, & grounds	42	14	-	28	35	14	30.8

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
88. Test stator for opens, shorts & grounds	35	7	-	42	28	14	31.5
89. Check & replace alternator bearings	42	7	-	42	28	14	31.5
90. Replace alternator brushes	42	14	7	28	28	14	29.4
91. Test diodes with ohmmeter or test lamp	42	14	21	28	28	7	28.7
92. Replace diodes	35	14	21	28	21	14	29.4
93. Solder diode connecting leads	42	14	14	21	35	14	31.5
94. Assemble alternator	42	7	-	35	35	14	32.2
95. Adjust voltage limiter	42	7	7	28	35	14	31.5
96. Check starter draw using hand induction ammeter	57	7	7	28	28	21	32.2
97. Check starter draw using battery starter/ tester	71	-	7	35	28	21	33.6
98. Isolate charging problem to ampere hour regulator or wiring	50	-	14	28	35	14	32.2
99. Check for starter voltage drop	57	-	14	21	28	21	30.8
100. By-pass starter solenoid or switch to check operation	78	-	-	21	42	35	40.6
101. Remove & replace starter from vehicle	78	-	-	7	35	57	44.6
102. Remove & replace solenoid from starter	78	-	-	7	35	57	44.6
103. Replace starter solenoid contacts & terminals	78	-	7	21	28	42	39.9
104. Disassemble & inspect starter	78	-	7	21	42	21	35.0
105. Test armature for shorts, opens, & grounds	50	-	7	35	28	21	33.6
106. Test field coils for shorts, opens, & grounds	42	-	7	35	35	14	32.9
107. Replace starter bushings	64	-	7	28	35	21	34.3
108. Replace starter brushes	71	-	14	21	42	14	32.9
109. Turn commutator on the armature lathe	42	-	28	28	21	14	29.4
110. Bench test starter	50	-	7	21	42	21	35.0

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OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
111. Check operation of ignition by-pass	64	7	14	42	28	7	30.8
112. Check & replace starter drive	64	7	7	21	42	21	35.7
113. Use a test light to determine if voltage is present at a specified component	78	7	-	28	35	28	37.1
114. By-pass switches or replay to check for operation	71	7	-	42	28	21	35.0
115. Use a short-finder or similar method to locate grounds	78	7	-	35	28	28	36.4
116. Perform drilling and electrical work involved in mounting electrical accessories	78	7	7	28	42	14	34.3
117. Remove & replace electrical units such as radios, headlights, gas gauges, etc.	92	7	-	42	14	35	36.4
118. Use voltmeter, ammeter, and ohmmeter to test circuits & components	64	7	14	28	28	21	33.6
119. Remove & replace various wiring harnesses using a service manual	71	7	7	14	50	21	36.8
120. Make a wire splicing with soldered joints or solderless connectors	78	7	-	21	50	21	37.5
121. Check dwell & rpm with tach-dwell meter & adjust to specifications	85	14	-	7	50	28	37.5
122. Set ignition timing & is able to find tune-up specifications in the shop manual	92	7	-	-	42	50	42.5
Cooling System							
123. Check cooling system for leaks	92	-	-	7	35	57	44.6
124. Check and/or replace all belts as needed	92	-	-	7	42	50	43.9
125. Check level of coolant in radiator & adjust as needed	92	-	-	7	42	50	43.9

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OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES: NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
126. Drain & flush cooling system--winterize to minus 30° F.	85	-	-	21	28	50	42.5
127. Flush & clean radiator	71	-	-	28	28	42	40.6
128. Replace seals or gaskets in the cooling system	78	7	-	14	57	21	38.2
129. Check & replace hoses in the cooling system	92	-	-	-	64	35	43.1
130. Check pressure caps on the radiator & replace as needed	78	-	-	14	50	35	41.7
131. Check thermostat & replace as needed	92	-	-	14	35	50	43.2
132. Inspect and/or replace water pump	85	7	-	14	50	28	38.9
133. Repair minor radiator leaks	64	7	7	7	57	14	34.0
134. Test & determine antifreeze protection	100	7	-	-	42	50	42.5
135. Clean outside of radiator to assure cooling	100	-	-	-	78	21	41.7
136. Clean & maintain the cooling capacity of an air-cooled engine	92	-	-	7	78	14	40.3
137. Solder & repair leaks in the cooling system	50	-	7	28	42	14	33.6
Valve & Valve Train							
138. Clean and inspect valves	92	-	-	14	50	35	41.7
139. Clean and inspect cylinder heads	92	-	-	21	35	42	41.3
140. Measure valve guide diameter & out-of-round	50	-	14	14	21	42	36.4
141. Knurl & ream valve guide to original diameter	35	-	7	28	42	14	33.6
142. Reface valves	85	-	7	14	35	42	40.6
143. Grind valve seats	78	-	7	7	42	35	37.8
144. Check valve seat contact	92	-	7	14	35	42	40.6
145. Check valve spring tension	85	-	14	7	42	35	39.2

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JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
146. Check timing of valve opening & closing in an internal combustion engine	71	-	7	21	35	35	39.2
147. Check seating of valve in an internal combustion 4-cycle engine	78	-	-	14	71	14	39.6
148. Adjust tappet clearance	92	-	-	7	42	50	43.9
149. Make cylinder compression tests	92	-	-	-	57	42	43.8
150. Time crankshaft & camshaft	85	-	-	14	42	42	42.0
Lubrication System							
151. Check & correct vital fluid levels (differential, transmission, engine) following the manufacturer's recommendations	100	-	-	7	42	50	43.9
152. Change engine oil & filter	92	-	-	7	50	42	43.1
153. Change transmission & hydraulic fluid & filter	92	-	-	7	57	35	42.4
154. Check oil level in internal combustion engine	100	-	-	-	57	42	43.8
155. Change oil in internal combustion engine	100	-	-	-	57	42	43.8
156. Change oil filter in internal combustion engine	100	-	-	-	50	50	45.0
157. Clean and/or lubricate linkages in internal combustion engine	92	-	-	-	57	42	43.8
158. Clean & lubricate wheel bearings of tractors & other farm machines	92	-	-	7	50	42	43.1

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OCCUPATON: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Brake System							
159. Check & adjust brakes on tractors & other power driven farm machines	92	7	-	-	50	35	38.2
160. Determine when brakes need replacement or major repair	85	7	7	14	42	28	37.1
161. Check and/or replace fluid in hydraulic brake system	100	-	-	21	42	35	40.6
162. Clean-up & deglaze brake disks that have useable life left in them	64	7	14	21	28	28	35.0
163. Install seals & O-rings as required in brake systems	78	7	-	35	42	14	35.0
Engine Repair							
164. Check cylinder compression & interpret the readings (both wet & dry)	92	7	-	21	28	42	39.2
165. Remove & replace the distributor	78	7	-	14	42	35	39.2
166. Check & adjust or replace distributor points & condensers	92	7	-	7	35	50	41.8
167. Adjust valves	85	7	-	28	42	28	39.9
168. Adjust idle speed & mixture	92	-	-	21	50	28	40.3
169. Check & replace air filter	92	7	-	14	21	57	41.8
170. Remove & replace power steering pump & bleed the system	85	7	7	28	35	21	35.0
171. Inspect cylinder head for warpage & cracks	85	7	7	28	35	21	35.0
172. Assemble cylinder heads	85	7	7	14	42	28	37.1
173. Remove & replace valve lifters	71	7	7	42	28	14	32.9
174. Inspect push rods for wear & trueness	57	7	7	35	42	7	32.9
175. Inspect & recondition rocker arm assembly	71	7	7	35	42	7	32.9

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OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS:	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
176. Align & install timing gears	71	7	-	35	14	35	34.3
177. Visually inspect camshaft & lifters	85	7	7	50	21	21	36.0
178. Measure camshaft journals to determine size & wear	35	7	14	28	28	14	30.1
179. Adjust solid lifter valve lash	78	7	-	14	50	21	35.4
180. Check crankshaft end play	42	7	14	7	42	14	29.4
181. Disassemble & inspect engine visually	71	7	-	21	50	21	37.5
182. Remove & install cam bearings	71	7	-	42	35	7	30.8
183. Hone cylinder walls	85	7	-	35	42	14	35.0
184. Clean ring grooves	78	7	-	21	35	28	35.0
185. Check piston ring & gap	78	7	-	14	42	28	35.7
186. Check piston ring side clearance	71	7	-	21	42	21	34.3
187. Mike a piston to determine size	64	7	7	21	35	21	32.9
188. Mike the crankshaft to determine journal size, out-of-round & taper	64	7	7	28	21	28	32.9
189. Check crankshaft end play	71	7	7	21	35	21	32.9
190. Fit & install rear main bearing oil seal	78	7	14	14	28	28	32.9
191. Compress piston rings & install pistons	78	7	7	14	35	28	34.3
192. Check rod & main journal oil clearance	64	7	-	14	35	28	32.9
193. Remove & replace cylinder heads	78	7	7	14	50	21	36.8
194. Torque connecting rod caps	78	7	-	14	42	28	35.7
195. Check piston pin fit	64	7	-	21	35	21	31.5
196. Rebuild & check oil pump	71	7	-	21	42	21	34.3
197. Test fuel pump pressure, volume, & vacuum	71	7	-	42	28	14	31.5
198. Remove & replace fuel pump	85	-	-	21	50	28	40.3
199. Check, clean, and/or replace fuel filter	100	-	-	21	42	35	40.6
200. Bend & flare tubing to make fuel line	100	-	-	35	28	35	39.2

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OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
201. Remove & replace carburetor	92	-	-	21	21	57	43.2
202. Overhaul carburetor including: disassembling, cleaning, installing new parts, making all adjustments, reassembling, test	64	7	7	7	35	35	35.7
203. Trouble shoot carburetor	71	7	-	14	42	35	39.2
204. Remove & replace intake manifold & heads	85	7	-	7	42	42	40.6
205. Disassemble cylinder heads	78	7	-	7	42	42	40.6
Power Transmission							
206. Determine length & size of V-belt for specified power transmission	64	-	7	21	35	35	39.2
207. Install pulleys as specified for specific machines	92	-	-	28	35	35	39.9
208. Use service manual trouble shooting procedures for transmissions	92	-	-	21	42	35	40.6
209. Disassemble, inspect, & reassemble transmission	64	7	-	21	28	35	35.7
210. Adjust the transmission bands of a fluid transmission system	35	14	-	35	28	14	30.1
211. Adjust the linkage of a standard transmission system	64	7	-	42	42	14	37.1
212. Check level of transmission fluid	92	-	-	21	35	42	41.3
213. Change transmission fluid	92	-	-	28	14	57	42.5
214. Overhaul & repair universal joint assemblies & shields used in conjunction with universal joint power drive	92	7	-	14	42	35	39.2

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OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Hydraulic Systems							
215. Check operation of hydraulic lift and/or hydraulic system of other farm machines	92	-	-	50	35	14	36.0
216. Perform maintenance operations on the hydraulic system as specified in the manual	78	7	-	28	35	28	37.1
217. Identify seal & O-ring wear & to recognize what caused wear	71	-	-	35	28	28	35.7
218. Install or replace seals & O-rings using recommended practices and procedures	92	7	-	21	35	35	38.5
219. Overhaul & repair hydraulic cylinders common to agricultural hydraulic systems	85	-	-	21	28	42	38.5
Electric Power							
220. Identify situations in which electric power is appropriate	50	21	-	35	21	14	28.0
221. Lubricate electric motors	78	7	7	50	14	21	33.2
222. Determine size & type of electric motors for specified jobs	28	14	14	35	7	21	28.0
Tires & Wheels							
223. Inflate tires	85	-	7	28	21	42	39.2
224. Add liquids to tires for increased weight	64	-	14	35	21	28	35.7
225. Change tire on tractor and/or other farm machinery & mount & dismount tires from rim	71	-	14	35	28	21	35.0
226. Replace tire valve stems	64	-	14	28	35	14	32.2

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JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
227. Repair tires (tubes & casings)	71	7	7	28	21	35	36.4
228. Replace rear wheel bearings	71	7	7	14	50	14	33.3
229. Replace rear wheel grease seals	78	7	7	14	57	7	32.6
230. Change differential fluid	92	-	-	21	42	35	40.6
231. Check differential fluid level	92	-	-	21	35	42	41.3
Working with the Farm Equipment Operator							
232. Listen to farm equipment operator statement of problem & identify cause of malfunction	85	-	-	14	50	35	41.7
233. Ask questions of the farm equipment operator to help identify cause of malfunction	85	-	-	14	57	28	41.0
234. Explain to the farm equipment operator what must be done to correct the malfunction	71	7	-	14	50	28	38.9
235. Explain to the farm equipment operator what actually was done to correct the malfunction	71	14	-	21	28	35	36.4
236. Show replaced parts to farm equipment operator and explain need for replacement	57	7	14	21	14	42	36.4
237. Offer continued service and/or related merchandise to meet needs of the farm equipment operator	78	-	14	28	21	35	37.1
238. Complete a service repair order	92	-	-	28	42	28	39.2
239. Translate the farm equipment operator complaints or requests into mechanics instructions	71	-	-	50	21	28	37.4
240. Store miscellaneous products	64	-	7	50	7	35	36.7
241. Order parts & to follow-through on the parts ordered	57	7	-	35	21	35	37.1

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OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Planting, Tillage, Fertilizer & Chemical Applicators, Cultivators, Harvesting, Drying & Storing Equipment							
242. Locate and check equipment parts upon delivery	92	-	-	28	42	28	39.2
243. Separate items into convenient piles for easy identification and assembly	92	7	-	35	28	28	36.4
244. Assemble farm equipment according to assembly instructions	100	-	-	21	21	57	43.2
245. Check all bolts for tightness and tighten loose bolts	85	-	-	14	14	71	45.3
246. Check for defective parts on farm equipment and replace	100	-	-	14	50	35	41.7
247. Locate the parts in the parts bank and list desired parts	92	-	-	21	50	28	40.3
248. Instruct other workers in assembling farm equipment	50	7	14	35	14	21	30.1
249. Lubricate the equipment according to manufacturer's specifications	100	-	-	14	35	50	43.2
250. Make initial adjustments to insure proper and smooth operation of the equipment	100	-	-	14	50	35	41.7
251. Operate and test the equipment for smooth operation	92	-	-	14	57	28	41.0
252. Repair farm equipment	92	7	-	7	42	42	40.6
Reconditioning Agricultural Equipment							
253. Clean equipment with chemicals, air, steam	92	-	-	28	35	35	39.9
254. Maintain spraying equipment	78	7	7	28	35	14	31.5
255. Remove dents	50	14	14	21	28	14	28.7

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION:

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
256. Sand equipment	71	7	21	28	21	21	32.2
257. Mask equipment for painting	57	7	14	28	28	21	33.6
258. Apply primer coat	57	14	21	21	28	14	30.1
259. Apply finish coat	57	14	21	7	42	14	31.5
260. Touch up equipment	64	7	21	28	35	7	30.8
261. Apply stencils and decals	64	7	14	35	35	7	31.5
262. Mix paint	64	21	21	7	35	14	29.4
263. Thin paint	64	14	21	14	35	14	30.8
264. Straighten metal with oxy-acetylene	78	7	7	14	50	21	36.8
265. Braze metal	64	7	14	28	28	21	33.6
266. Use body fillers	42	21	14	14	35	7	26.6
267. Use air operated tools to tighten bolts	71	7	-	14	42	35	39.2
Perform General Office Procedures							
268. Use the telephone	92	-	14	21	21	42	38.5
269. Write Memos	78	-	7	28	42	21	37.1
270. Maintain a filing system	57	7	21	7	28	21	28.7
271. Listen to operator's statement of the problem	92	7	-	14	50	28	38.9
272. Ask questions to help identify cause of malfunction	85	7	-	14	42	35	39.2
273. Translate operator's complaints or requests into mechanics terminology	85	7	-	21	35	42	42.0
274. Write letters	57	14	14	14	21	28	30.8
275. Determine what parts should be ordered	85	14	-	14	42	28	36.4
276. Order the parts	50	21	-	14	50	7	29.8
277. Locate packing slips	71	7	14	-	57	14	33.3
278. Check items against packing slip	71	7	14	-	42	28	34.3
279. Notate and make claims for discrepencies shortages or damages of parts received	71	7	-	14	42	28	35.7

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OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Observe Safety Precautions							
280. Use fire extinguishers	71	-	-	14	28	50	40.4
281. Wear appropriate clothing for various tasks	92	-	7	21	21	50	41.1
282. Interpret safety symbols	85	-	7	21	28	42	39.9
283. Adjust safety shields (Was not computed)	-	-	-	-	-	-	-
284. Identify potential safety hazards	78	-	7	21	28	35	36.4
285. Store inflammable materials safely	92	-	-	14	42	42	42.0
286. Use hand tools safely	92	-	-	-	50	50	45.0
287. Use power tools safely	92	-	-	-	50	50	45.0
288. Maintain clean work areas	100	-	-	7	57	35	42.4
289. Use proper lifting and carrying methods	78	-	7	14	42	35	39.9
290. Use electrical cords and connections safely	92	-	7	7	42	42	41.3
291. Ventilate work areas as required	85	-	7	7	42	35	37.8
292. Administer minor first aid	78	-	7	14	50	21	36.1
293. Correct potential fire hazards	92	-	-	7	57	35	42.4
294. Replace light bulbs	85	-	7	-	42	50	43.2
295. Tow equipment in a safe manner	71	7	-	-	42	42	38.5

[a]The respondents were asked to indicate whether the skill was required within the first 60 days on the job

[b]Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

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OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Farm Power					
1. Basic principles of operation of compression ignition engines	64	-	35	X	
2. Basic principles of operation of spark ignition engines	64	-	35	X	
3. Basic differences between diesel & gasoline fueled engines	78	-	21	X	
4. Advantages & common agricultural uses of various types of engines	28	-	64		X
5. The specifications (directions) in the manual for cleaning and/or replacing filters in the fuel line of a gasoline fueled engine	57	-	42	X	
6. The specifications (directions) in the manual for cleaning and/or adjusting the carburetor of a gasoline fueled engine	64	-	35	X	
Tools					
7. The kind & purpose of hand & power tools commonly found in the farm repair shop	64	-	35	X	
8. The sizes & units of measurement of tools commonly used in the farm repair shop	42	-	57	X	
9. The measuring instruments commonly used in the farm repair shop	35	-	64	X	
10. The safety practices to be followed when using hand or power tools in the repair shop	71	-	28	X	
Welding					
11. The purpose of the controls on the oxy-acetylene welder	50	-	50	X	
12. The purpose of the controls on the arc welder	50	-	50	X	
13. The appropriate kind of welds commonly needed on farm equipment	28	-	71		X
14. The condition of metal needed for satisfactory welds on farm equipment	35	-	64	X	
15. The appropriate kind of welds commonly needed on farm equipment	28	-	71		X

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VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
16. The use of tables & charts used in connection with welding jobs	21	-	78		X
17. Settings of arc welder (amperage, voltage, polarity)	35	-	64	X	
18. Polarity, direct & alternating current	28	7	64		X
19. Safety practices for the welder	50	-	50	X	
20. Safety practices to equipment when welding (fires, damage to buildings, livestock, etc.)	50	-	50	X	
21. The effect of heat on metals	28	-	71		X
22. The characteristics of a satisfactory weld	35	-	64	X	
23. The melting temperature of various metals used in farm machinery & equipment	-	7	85		X
24. The characteristics of appropriate oxy-acetylene flames for various purposes	21	-	78		X
25. The various gases used for welding	14	7	78		X
26. Tables & charts for use in welding problems commonly found in repairing & maintaining farm machinery	-	7	92		X
Battery & Ignition					
27. Materials & chemistry of battery operation	14	21	64		X
28. Series & parallel circuits to increase battery output voltage of current flow	42	-	57	X	
29. Reasons for battery preventive maintenance & results of neglect	42	7	50	X	
30. The battery's function in the charging & starting system	42	-	57	X	
31. The causes & results of battery sulfation	21	-	85		X
32. The safety precautions to be observed when charging & servicing a battery	28	-	71		X
33. Battery charging voltage as related to state of charge, charging rates, & battery condition	35	-	64	X	
34. Measurement & significance of specific gravity	14	7	78		X
35. The criteria used in selecting a replacement battery	21	-	78		X

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
36. The use & operation of the generator-alternator-regulator test	7	-	92		X
37. The relationship between voltage, current, resistance, & power as stated by Ohm's Law	14	7	78		X
38. Basic electricity & magnetism	14	21	64		X
39. Operating principles of the DC generator & electromagnetic induction	14	14	78		X
40. How to trace circuits in the wiring diagram	28	-	71		X
41. Understands the use of & differences between "A" and "B" circuit generators	7	14	78		X
42. Direct & alternating current principles	14	7	78		X
43. Electrical & equipment nomenclature	-	14	85		X
44. The operation of the voltage & current limiters	14	7	78		X
45. The operation of the cut-out relay	28	-	71		X
46. Testing procedures for locating shorts, opens, or grounds in armature & field coils	35	7	57	X	
47. The procedure for isolating generator from regulator problems	42	7	50	X	
48. The use & operation of the armature lathe	-	42	57		X
49. Operation & use of neon-type timing lights	28	7	64		X
50. The different methods for adjusting regulator settings	14	21	64		X
51. The use of the volt meter in checking voltage drop	28	7	64		X
52. The tailoring of the voltage regulator setting for specific applications	7	-	92		X
53. The principles involved in polarizing the generator	42	-	57	X	
54. The use & operation of the battery starter/tester	21	-	78		X
55. Basic operating principles of the series wound motor	7	35	64		X
56. The test procedures for isolating starter problems	21	14	64		X
57. Starter bench test procedures	14	7	78		X
58. Starter drive operation	28	7	64		X
59. Ignition resistor by-pass operation	7	-	92		X
60. Wire size & current capacity	21	7	64		X

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OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
61. The operation & servicing of fuses & circuit breakers	28	-	71		X
62. Characteristics of series & parallel circuits	21	7	71		X
63. Operating principles of switches, relays, solenoids, thermo electric switches & gauges, d'Arsenal gauges, pressure or heat sensitive switches	21	7	71		X
64. The procedures for checking for & isolating a defective unit	21	-	71		X
65. The operation & use of ammeter, ohmmeter, and voltmeter	28	7	64		X
66. The relationship between dwell & point gap	42	-	57	X	
67. The relationship between dwell & timing	50	-	50	X	
68. The interpretation & use of scope wave forms	7	35	57		X
69. Ignition timing & it's relationship to crankshaft position, engine speed, & load	42	7	50	X	
70. The function of the ignition coil & condenser	42	7	42	X	
71. Spark plug construction & selection	21	7	71		X
72. The condition of plug firing tip as an indicator of engine condition	42	-	57	X	
Cooling System					
73. Purpose & method of flushing cooling system	42	-	57	X	
74. Instructions in the manual for servicing the cooling system	42	-	57	X	
75. Instruction in manual governing adjustment of fan belt	42	-	57	X	
76. Instruction in manual for checking & replacing water pump on an engine	35	-	64	X	
77. Specifications in the manual for pressure to be maintained	21	7	71		X
78. Chemicals & equipment needed to clean & flush radiator	21	7	71		X
79. Types & uses of gaskets & gasket remanents	7	7	85		X
80. Flow of coolant through cooling system	28	14	57		X
81. Types & uses of the various engine coolants & anti-freezes	42	7	50	X	

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CRITICAL IMPORTANCE IN PERCENTAGES

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Valve & Valve Train					
82. Instructions in the manual for checking timing of valves in an internal combustion 4-cycle engine	50	-	50	X	
83. Methods for checking seating of valves in an internal combustion 4-cycle engine	42	-	57	X	
84. Specifications in the manual for grinding or replacement of valves	14	-	78		X
85. Interpretation & use of cylinder compression readings	50	-	50	X	
86. The purpose & use of various types of valve guide oil seals	21	14	64		X
87. Cylinder head design & construction	21	7	71		X
88. The use of the valve refacer	42	-	57	X	
89. The use of the micrometer	50	-	50	X	
90. Hydraulic & solid valve lifters & operation	28	-	71		X
91. The valve train lubrication system	28	-	71		X
92. Camshaft operation	28	-	71		X
93. Check procedures for timing gears	35	-	64	X	
94. Valve timing & methods for checking	50	-	50	X	
95. The need for valve lash	42	-	57	X	
Lubrication System					
96. Directions in manual for checking and/or changing oil in internal combustion engine	57	-	42	X	
97. Code specifications for weights & grades of oil specified in manual	21	-	78		X
98. Instructions in manual for cleaning & lubricating internal combustion engine	42	-	57	X	
99. Instruction in manual for checking & replacing transmission hydraulic fluid	42	-	57	X	
100. Code designations for transmission fluids	21	-	71		X

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND					
101. Instructions in manual for checking and/or changing lubricant in differential of tractors and/or other farm equipment	42	-	57	X	
102. Methods & specifications for cleaning, lubricating & adjusting wheel bearings in tractors & other farm equipment	50	-	50	X	
103. Manual specifications for wheel bearings for the specific machine	35	-	64	X	
Brake System					
104. Manual specifications for adjustment of brakes	42	-	57	X	
105. Specifications in manual regarding condition of brake linings	35	-	64	X	
106. Specifications in manual regarding choice & use of hydraulic brake fluid	28	7	64		X
Engine Repair					
107. Use of cylinder compression readings	57	-	42	X	
108. Cylinder design & construction	28	14	57		X
109. Engine operation & construction (2 & 4 cycle)	42	-	50	X	
110. Other types of engines	21	7	71		X
111. Engine block construction & common wear points	21	-	78		X
112. Cylinder wall measuring & resurfacing	28	7	64		X
113. Heat, expansion & contraction of metals	21	14	64		X
114. The composition of engine bearings	14	14	71		X
115. Operating conditions of engine bearings	50	7	42	X	
116. Piston & rod construction & rebuilding procedure	35	21	42	X	
117. Oil clearance & its measurement	28	7	64		X
118. The engine lubrication system	50	7	42	X	
119. Procedures for checking the oil pump	21	7	71		X
120. Crankshaft construction & operation	35	7	57	X	

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND					
121. The use of the manufacturer's specifications & tolerances	35	-	64	X	
122. The measurements & inspection of a crankshaft	42	-	57	X	
123. Piston ring classification & construction	21	7	71		X
124. The use of a torque wrench	57	-	42	X	
125. The ignition timing & methods of checking	64	-	35	X	
126. Fuel pump construction & operation	28	14	57		X
127. Fuel pump testing procedure	28	7	64		X
128. Carburetor construction	21	7	71		X
129. Carburetor test & adjustment procedures	50	7	42	X	
Power Transmission					
130. How to measure length of belt needed	35	7	57	X	
131. How to determine size of V-belt needed for specified pulleys	28	7	64		X
132. The instructions in the manual for the transmission system being serviced	35	-	64	X	
133. The instructions in the manual for adjusting a standard transmission	42	-	57	X	
134. Specifications of transmission fluid for the specific machine	21	-	78		X
135. Principles of bearing adjustment	42	-	57	X	
136. Appropriate manual for specifications regarding performance of the system	28	-	71		X
137. Tolerances for parts of hydraulic system as specified in the manual	28	-	71		X
138. Specifications for parts of the hydraulic system as specified in the manual	28	-	71		X
Electric Power					
139. Characteristics of electric power that give it advantages over power from internal combustion engines	14	21	64		X

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
140. Potential danger to motors by over lubricating	35	7	57	X	
141. Basic controls for electric equipment as thermostats, pressure switches, time clocks, etc.	14	14	71		X
142. Ability of electric motors of various types to start under load	7	21	71		X
143. Ability of electric motors to operate under continuous load	7	28	64		X
144. Kinds of motors to use under hazardous conditions (as in wet conditions, in dusty atmosphere, etc.,)	21	14	64		X
145. Relationship of size of wire, distance, & voltage to carrying capacity of wire	28	21	50		X
146. Kinds of controls available & functions of each kind	-	14	85		X
Tires & Wheels					
147. Need for proper inflation of tires	57	-	42	X	
148. Inflation directions for tires of machinery being serviced	35	-	64	X	
149. Materials to use for adding weight to tires	42	-	57	X	
Working With the Farm Equipment Operator					
150. How to relate Farm Equipment Operator's statements to typical malfunction	42	-	57	X	
151. Kinds of questions to ask to bring out common causes of malfunction	50	-	50	X	
152. How to translate the job to be done into language the mechanic can understand	57	-	42	X	
153. How to explain what was done so that the Farm Equipment Operator is satisfied the job was completed efficiently and satisfactorily	35	14	50	X	
154. Needs of the Farm Equipment Operator for additional services	7	7	85		X
155. Needs of the Farm Equipment Operator for related services	7	7	85		X

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
156. The use of a service repair order	57	-	42	X	
157. Common complaints & problems & the way in which the complaints should be written	28	7	64		X
158. The commonly stored related parts	7	7	78		X
159. The parts ordering procedure	42	21	35	X	
160. The ways of assigning work to various mechanics	35	28	35	X	
Planting, Tillage, Fertilizer & Chemical Applicators, Cultivators, Harvesting, Drying & Storing Equipment					
161. Reasons for locating & checking equipment parts upon delivery	14	7	78		X
162. How to assemble farm equipment	50	-	50	X	
163. How to check defective parts on farm equipment	35	-	64	X	
164. How to use farm equipment parts book	50	-	50	X	
165. How to instruct employees with different attitudes, educational levels and socio-economic backgrounds	21	28	50		X
166. Basic operating principles of farm equipment	35	-	64	X	
Reconditioning Agricultural Equipment					
167. Safe use of chemicals used for cleaning	42	-	57	X	
168. Basic operating principles of the air compressor	50	-	50	X	
169. Basic operating principles of steam producing equipment	42	7	50	X	
170. Basic operating principles of spray painting equipment	35	-	64	X	
171. Reasons for using various tools to remove dents	21	14	64		X
172. Basic operating principles of electric sanders	50	7	42	X	
173. Reasons for sanding prior to painting	50	-	50	X	
174. Reasons for masking equipment prior to painting	42	-	57	X	
175. Reasons primer coats are applied	35	-	64	X	
176. How to apply a finish coat of paint	35	-	64	X	
177. How to touch up equipment with paint	28	-	71		X
178. How to apply stencils and decals	42	-	57	X	

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
179. Procedures for proper paint mixing	28	7	64		X
180. How to thin paint with various paint thinners	35	-	64	X	
181. Understand the basic operating principles of oxy-acetylene equipment	50	-	50	X	
182. How to straighten metal using oxy-acetylene equipment	42	-	57	X	
183. Safety practices to follow while using oxy-acetylene equipment	57	-	42	X	
184. Procedures for spraying metal	28	7	64		X
185. The ways in which body fillers are used	21	14	64		X
186. The basic operating principles of air operated tools	42	-	57	X	
Perform General Office Procedures					
187. Businesslike procedures in using the telephone	42	7	50	X	
188. How to write a memo	21	7	71		X
189. Simple filing systems for office use	21	21	57		X
190. How to listen effectively	35	7	57	X	
191. How to communicate effectively	35	7	57	X	
192. The basic elements of business letter writing	14	35	50		X
193. How to interpret supply needs	21	28	50		X
194. How to complete an order form	21	21	57		X
195. Uses of packing slips	21	7	71		X
196. Reasons items must be checked with packing slip	21	7	71		X
197. Procedures for making claims against shortages or damaged parts received	21	21	57		X
Observe Safety Precautions					
198. The basic operating principles of fire extinguishers	64	-	35	X	
199. How to use fire extinguishers on various types of fires	64	-	35	X	
200. Reasons for wearing clothing appropriate to the tasks	50	-	50	X	
201. The meaning of various safety symbols	57	-	42	X	
202. The uses of safety shields	64	-	35	X	
203. How to conduct a safety hazard survey	28	14	57		X

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
204. The importance of safety practices in the farm business	42	-	57	X	
205. The need for safe storage of inflammable materials	71	7	21	X	
206. How to store inflammable materials	64	14	21	X	
207. The legal requirements of storing inflammable materials	64	14	21	X	
208. How to use hand tools safely	64	-	35	X	
209. How to use power tools safely	64	-	35	X	
210. Relationship between clean work areas and safety	57	-	42	X	
211. Physical problems that can result from careless lifting	42	-	57	X	
212. How to lift without bending the back	35	-	64	X	
213. Methods of carrying without straining the back	42	-	57	X	
214. Simple electrical safety practices	50	-	50	X	
215. Dangers of a poorly ventilated work area	50	-	50	X	
216. How to adequately ventilate a work area under different conditions	35	7	57	X	
217. Simple first aid procedures	64	-	35	X	
218. How to prevent fires	64	-	35	X	
219. Safety practices to use in changing light bulbs	57	7	35	X	
220. Procedures for connecting tow equipment	57	-	42	X	
221. Uses of different equipment in towing	57	7	35	X	
222. State highway regulations regarding towing equipment	42	14	42	X	

[a]If 33 percent or more of the respondents indicated a knowledge was "essential", the knowledge is to be accepted and included in the modules.

[b]If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

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BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Exhibits neatness in --					
1. Handling tools and equipment	42	-	57	X	
2. Keeping supplies in order	57	-	42	X	
3. The work area and office	42	-	57	X	
4. Grooming and dressing appropriately for work	21	-	78		X
5. Setting examples for other employees in terms of working and other personal contacts in the work setting	42	-	57	X	
Shows dependability in --					
6. Completing work on time	57	-	42	X	
7. Arriving to work on time	78	-	21	X	
8. Coming back from "lunch" and "breaks" on time	78	-	21	X	
9. Reporting to the supervisor when there is a need to leave the work area or setting	64	-	35	X	
10. Coming to work regularly	85	-	14	X	
11. Following instructions and carrying out given tasks	85	-	14	X	
12. Reporting to supervisor abnormal situations in the work setting	71	-	28	X	
13. Delegating appropriate responsibility to other employees and making sure the given tasks were performed properly	28	14	57		X
14. Accepting work setting problem reports and using appropriate supervisory techniques in correcting the problems reported	28	-	64		X
15. Analyzing personnel problems and using viable supervisory means in solving problems	35	7	57	X	
16. Producing the best quality work	71	-	28	X	
17. Returning promptly all calls	50	-	50	X	
18. Being on time for appointments or calling ahead if detained	57	-	42	X	
19. Accepting and completing jobs assigned	64	-	35	X	
20. Being sure any reports or records are completed	57	-	42	X	
21. Being able to work with minimal supervision	50	-	50	X	
22. Being able to interpret & follow written & verbal directions	57	-	42	X	
23. Properly supervising other employees	21	7	71		X
24. Anticipating need for & care of tools, equipment & supplies	42	-	57	X	

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BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
25. Demonstrating a concern for safety practices	42	-	57	X	
26. Being sure reports are forwarded to the appropriate person	57	-	35	X	
27. Planning and organizing work load	21	7	64		X
Behaves courteously toward --					
28. Fellow employees	57	-	42	X	
29. Superiors	64	-	35	X	
30. Subordinates	64	-	35	X	
31. Visitors	57	-	42	X	
Is willing to work --					
32. With details	35	-	64	X	
33. With complex problems	42	-	57	X	
34. With routine types of work	64	-	35	X	
35. With tools, machines and equipment	78	-	21	X	
36. With continuous job and work area change	50	-	50	X	
37. Under time pressure	35	-	64	X	
38. Under performance standard pressures	42	-	57	X	
39. On individual tasks for long period of time	42	-	57	X	
40. On group tasks	21	-	71		X
41. As a follower	21	-	78		X
42. As a leader	14	-	85		X
43. Under normal conditions	50	7	42	X	
44. Under abnormal conditions	35	-	64	X	
45. Things rather than people	35	7	57	X	
46. Performing preventive maintenance	57	7	35	X	
47. Using materials and supplies conservatively	57	7	35	X	
Confer with visitors in --					
48. Explaining the basic operation of equipment and systems when appropriate	28	7	64		X
49. Explaining solution to problems when appropriate	28	-	71		X

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BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
50. Locating various employees and site areas	35	14	50	X	
51. Explaining the institution's policy	14	35	50		X
Becoming involved in --					
52. Using telephone for personal purposes	7	64	28		X
53. Responding to letter inquires	7	28	64		X
54. Handling information from files	7	35	57		X
55. Releasing information concerning total operations	7	57	35		X
56. Improving ones scope of knowledge and ability	28	-	71		X
57. Technical and professional local associations	7	21	71		X
58. Technical and professional state associations	7	21	71		X
59. Technical and professional national associations	7	21	71		X
60. Public relation activities	7	28	64		X
61. Employee relation activities	7	14	78		X
62. Local, state and federal political activities	7	35	57		X
63. Continuing education and personal upgrading	35	-	64	X	
Displays --					
64. Leadership ability	35	-	64	X	
65. Accuracy in working	64	-	35	X	
66. Efficient work habits	71	-	28	X	
67. Confidence in working	64	-	35	X	
68. Loyalty toward employer and/or firm	50	-	50	X	
69. Desire to maintain acceptable personal physical condition	35	-	64	X	
Demonstrates a concern for hazards in terms of --					
70. Safety and health of workers	42	-	57	X	
71. Safety to buildings and equipment	42	-	57	X	
72. Safety to the job	50	-	50	X	
73. Safety and health of visitors	42	7	50	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Demonstrates respect for --					
74. Company vehicles and demonstrates safe driving habits	85	-	7	X	

[a]If 33 percent or more of the respondents indicated a behavior was "essential", the behavior is to be accepted and included in the modules.

[b]If less than 33 percent of the respondents declared that a behavior was "essential", the behavior is to be reviewed by module developers to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
1. To be able to perform and apply simple mathematical functions: addition, subtraction, multiplication, division	64	-	28	X	
2. To have a basic understanding of algebra	7	28	64		X
3. To be able to read at a level commensurate with tasks performed	71	-	28	X	
4. To be able to read and comprehend statistical & written data	64	-	35	X	
5. To be able to write words and numbers legibly	64	-	35	X	
6. To have a good command of the English language	50	-	50	X	
7. To be able to perceive color properly. (color blind test)	14	7	78		X
8. Has dexterity adequate for the job	42	-	57	X	
9. To be able to speak pleasantly & courteously in person & on communication devices	64	7	35	X	
10. To be familiar with rules of grammar, spelling, & punctuation	14	14	71		X
11. To be able to use alphabetic and numeric systems	21	7	71		X
12. To be able to practice good safety measures and use first aid when necessary	42	-	57	X	
13. To be able to use necessary hand power tools at a safe and productive level	64	7	28	X	
14. To be able to read & interpret drawings & specifications	50	7	42	X	
15. To be able to make drawings	14	14	71		X
16. To be able to maintain information & cost records for reporting purposes	21	14	64		X
17. To be able to manipulate and assemble parts	50	-	50	X	
18. Has a mechanical aptitude that will allow understanding of basic principles	71	-	28	X	
19. Must be able to stand for long periods of time	21	14	64		X
20. Has no physical impairments, such as serious back problems	50	-	50	X	
21. Must be able to run basic machine tools	57	-	42	X	
22. To have a basic understanding of trigonometry	14	42	42		X
23. To be able to use tools of electrical trade	14	21	57		X
24. To understand the use of all common electrical meters and testing devices	14	7	78		X
25. To be familiar with soldering	28	-	71		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
26. To understand electrical circuits	35	-	64	X	
27. Knows Ohms Law and electrical theory	7	42	50		X
28. Knows AC and DC current	42	-	57	X	
29. To understand series and parallel circuits	42	-	57	X	
30. To know relays, switches, transformers, capacitors, resistors, generators, batteries and magnetism	28	7	64		X
31. To understand the use of decimals in measuring tolerances & clearances	57	7	35	X	
32. To recognize degrees of rotation. (example: 10 degrees)	64	7	28	X	
33. To understand & properly complete manufacturer's warranty claim forms	21	28	50		X
34. Possesses good or corrected vision	50	-	50	X	
35. Possesses good or corrected hearing	50	-	50	X	
36. To have an understanding of basic physical sciences	14	7	78		X
37. To be able to solve problems related to plane and solid geometry	-	14	7		X
38. To read & interpret common measurement devices, using feet, inches, pounds, ounces, unit rotation	57	7	35	X	
39. To interpolate and extrapolate measurement values	14	35	50		X
40. To estimate and approximate measurements	28	7	64		X
41. To convert from one unit to another	7	7	85		X
42. To measure using conventional unit notation: Linear (length-distance), weight (ounces-pounds), size (area) & volume (cubic)	35	-	64	X	
43. To read, interpret, & use size-scale relationships	14	-	85		X
44. To record measurements using appropriate unit notation	21	7	71		X
45. To read & interpret basic graph relationships	14	21	64		X
46. To measure, compute, & estimate perimeter, areas & volumes	28	21	50		X
47. To read and interpret coefficient measurements	7	35	57		X
48. To read & interpret building trades measurements, specifications indicated in table form	21	28	50		X
49. To read and interpret board feet measurements	21	42	35		X
50. To read & interpret carpenter's rules & measurements tapes	28	42	28		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
51. To read and interpret building codes	7	53	38		X
52. To read & interpret building permits, & licenses, the forming square, mechanical drawing relationships, & orthographic projection views	7	53	38		X
53. To be able to discriminate between two-dimensional & three-dimensional patterns and objects	15	30	53		X
54. To demonstrate eye-hand coordination	30	23	46		X
55. To work or move readily about an elevated frame or structure, with no fear of height	7	46	46		X
56. Maintain balance readily, is physically agile	23	15	61		X
57. Has physical strength and stamina needed to pursue exhausting work	23	15	61		X
58. Knows building trades vocabulary	15	53	30		X
59. To be able to use necessary hand tools at a safe & productive level	61	15	23	X	
60. To be able to read at a level sufficient to understand & follow directions in equipment manuals & code books	61	-	38	X	
61. To be able to read at a level to interpret labels, directions on labels, & specifications in equipment manuals	61	-	46	X	
62. To understand electrical circuits used on control systems	23	7	69		X
63. To measure accurately to 0.01 inches	38	30	30		X
64. To understand basic operation of physical plant	7	15	76		X
65. To be able to record drawings	7	46	46		X
66. To operate a ten-key adding machine by the "touch system"	7	46	46		X
67. To be able to lift heavy objects	15	46	38		X
68. To be able to compare names & numbers accurately & quickly	7	23	69		X
69. Knows vocabulary of related industry	23	7	69		X
70. To be able to use the alphabetic & numberic systems when filing	7	30	61		X
71. To have a basic knowledge of geometry	7	15	76		X
72. To be able to write a clear and to the point letter	7	38	53		X
73. To be able to read and understand a county map	30	23	46		X
74. Is able to measure length to 1/4 of an inch	61	7	30	X	
75. Is able to measure length to 1/8 of an inch	61	7	30	X	
76. Is able to measure length to 1/16 of an inch	61	7	30	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
77. Is able to measure to 1/32 of an inch	53	15	30	X	
78. Is able to measure temperature of 1°F	38	15	46	X	
79. Is able to measure volume by pints	53	-	46	X	
80. Is able to measure volume by quarts	53	-	46	X	
81. Is able to measure volume by gallons	53	-	46	X	
82. Is able to measure using a micrometer to .020"	46	-	53	X	
83. Is able to measure using a micrometer to .010"	46	-	53	X	
84. Is able to measure using a micrometer to .002"	46	-	53	X	
85. Is able to maintain a log of time & duration of stay on a job	53	-	46	X	
86. Is able to enter cost of items in columns & total them	46	-	53	X	
87. Is able to determine sales tax		7	61		X
88. Is able to determine time on a job & determine customer labor		-	69		X
89. Is able to transfer number sequences from a source to a column	15	7	76		X
90. Is able to add columns of numbers	38	-	61	X	
91. Is able to understand money denominations	46	-	53	X	
92. Is able to make change	46	-	53	X	
93. To be able to lifty heavy object; minimum of 75 pounds	23	15	69		X
94. To read & interpret common measurement devices using feet	53	7	38	X	
95. To read & interpret common measurement devices using inches	53	7	38	X	
96. To read & interpret common measurement devices using pounds	53	7	38	X	
97. To read & interpret common measurement devices using ounces	38	7	46	X	
98. To read & interpret common measurement devices using unit notation	38	23	30	X	
99. To measure using conventional unit notation: Linear (length-distance)	53	7	38	X	
100. To measure using conventional unit notation: Weight (ounces-pounds	53	7	38	X	
101. To measure using conventional unit notation: Size (area)	46	7	46	X	
102. To measure using conventional unit notation: Volume (cubic)	38	7	53	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL EQUIPMENT MECHANIC

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: AGRICULTURAL EQUIPMENT MECHANIC

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]

[a]If 33 percent or more of the respondents indicated a basic skill was "essential", the skill is to be accepted and included in the modules.

[b]If less than 33 percent of the respondents declared that a basic skill was "essential", the skill is to be reviewed by module developers to determine whether this information should be included in the instructional modules.

TASK ANALYSIS RESULTS FOR FARM EQUIPMENT OPERATOR

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=18)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Operating the Tractor							
1. Observing all safety precautions in operating a tractor	100	--	--	5	33	61	45.2
2. Interpreting various safety and operating instructions	100	--	--	11	27	61	44.6
3. Observing all highway regulations in operating a tractor	100	--	--	11	44	44	42.9
4. Operating a tractor under field conditions and keeping records of hours used	83	--	--	38	27	33	38.7
5. Checking tractor oil, fuel tank, radiator and battery, changing oil, greasing and lubricating according to manufacturer's specifications	94	--	--	5	38	55	44.2
6. Connecting and towing equipment safely	94	--	5	--	55	38	42.0
7. Connecting and disconnecting a 3-point hitch	88	--	5	27	38	27	37.8
8. Connecting and disconnecting front end equipment to a tractor	61	11	11	27	38	5	29.1
9. Connecting and disconnecting PTO operated equipment to a tractor	100	--	--	22	38	38	40.8
Operating Tillage Equipment							
10. Attaching soil preparation equipment to a tractor	94	--	5	11	55	27	39.8

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=18)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
11. Observing safety precautions in operating soil preparation equipment	100	--	--	11	44	38	39.9
12. Adjusting soil preparation equipment for maximum efficiency	88	--	11	27	38	16	33.5
13. Preparing soil with the appropriate tractor and equipment under normal field conditions	83	5	5	27	33	16	30.8
14. Lubricating soil preparation equipment according to the manufacturer's spec.	94	--	--	11	55	27	38.8
15. Detaching soil preparation equipment from tractor	94	--	5	27	50	16	37.1
16. Cleaning and storing soil preparation equipment according to recommended procedures	83	--	--	38	33	22	35.6
Operating Fertilizer Equipment							
17. Attaching fertilizer application equipment to the tractor	88	--	--	50	33	16	36.2
18. Calibrating fertilizer application equipment for specified application	77	5	5	16	38	33	38.0
19. Observing all safety precautions in applying fertilizer	83	--	--	11	38	44	40.5
20. Applying fertilizer according to specified requirements	88	--	--	16	44	38	41.4
21. Lubricating fertilizer application equipment according to manufacturer's specifications	88	--	5	5	61	22	37.9
22. Detaching fertilizer application equipment from tractor	88	--	5	33	38	22	37.1

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=18)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
23. Cleaning and storing fertilizer application equipment according to recommended procedures	77	--	--	11	44	38	39.9
Operating Planting Equipment							
24. Attaching the planting equipment to the tractor	88	--	--	27	50	16	36.1
25. Observing safety precautions in operating planter	100	--	--	5	61	27	39.4
26. Adjusting the planter to plant at the appropriate rate, row width and depth	100	--	--	11	44	38	39.9
27. Adjusting the planter to match the seed size and the seed plate size	88	--	--	11	38	38	37.5
28. Checking the planting rate using the surface method of planting	88	--	--	16	38	33	36.5
29. Planting the crop as instructed by the supervisor	94	--	--	16	50	27	38.3
30. Lubricating the planting equipment according to the manufacturer's specifications	94	--	--	22	38	33	38.3
31. Detaching the planting equipment from the tractor	94	--	11	27	38	16	33.5
32. Cleaning and storing the planting equipment according th recommended procedures	83	--	--	22	44	27	37.7

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=18)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Operating Cultivation Equipment							
33. Attaching the cultivator to the tractor	77	--	16	22	38	16	33.0
34. Observing safety precautions in operating the cultivator	88	--	--	11	44	38	39.9
35. Adjusting the cultivator for appropriate width and depth	88	--	--	27	27	38	37.9
36. Cultivating the crop for weed control	77	--	16	22	44	11	32.9
37. Lubricating the cultivator according to manufacturer's specifications	83	--	5	27	27	33	36.4
38. Detaching the cultivator from the tractor	83	--	16	33	33	11	31.8
39. Cleaning and storing the cultivator according to recommended procedures	72	5	16	27	27	22	33.6
Operating Herbicide, Fumigation, Insecticide and Pesticide Equipment							
40. Attaching the chemical applying equipment to the tractor	83	5	11	22	33	27	36.0
41. Observing safety precautions in operating chemical equipment	88	5	--	5	22	66	43.8
42. Adjusting the chemical applying equipment for correct application	88	5	--	5	50	38	41.0
43. Following manufacturer's directions, label restrictions and all safety precautions in mixing and applying chemicals	94	5	--	--	16	77	45.4
44. Applying chemicals with the appropriate equipment for full coverage	94	5	--	5	50	38	41.0

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=18)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
45. Recording application rates and schedules	72	5	--	38	27	27	36.2
46. Lubricating the chemical applying equipment according to manufacturer's specifications	88	--	5	16	38	38	40.0
47. Cleaning and storing the chemical applying equipment according to recommended procedures	77	--	--	27	33	38	40.3
48. Storing the chemicals in a safe manner	100	--	--	5	33	61	45.2
49. Observing all legal and health requirements in applying dangerous chemicals	100	--	--	--	22	77	47.3
Operating the Self-Propelled Combine							
50. Calibrating and adjusting the self-propelled combine for maximum efficiency	72	--	--	16	16	55	38.7
51. Removing obstacles from the self-propelled combine	66	--	--	--	50	38	39.0
52. Operating a self-propelled combine under field conditions	66	--	--	11	61	16	35.7
53. Observing all safety precautions in operating a self-propelled combine	72	--	--	5	33	50	39.7
54. Lubricating the combine according to the manufacturer's specifications	72	--	--	16	44	27	35.9
55. Loading and transporting the crop	61	--	5	38	27	16	31.2
56. Unloading the crop at the appropriate time	61	--	5	22	44	11	30.7
57. Cleaning and storing the combine according to recommended procedures	66	--	--	22	44	22	35.2
Operating Conveying Equipment							
58. Operating conveying equipment safely	77	--	--	16	38	38	39.0

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=18)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
59. Adjusting belts and pulleys and lubricating conveying equipment according to specifications	77	--	--	33	33	27	36.6
Maintaining Buildings and Equipment							
60. Constructing fences and gates	50	5	11	55	16	5	28.1
61. Repairing minor leaks in building roofs	44	11	11	55	16	--	26.2
62. Applying wood and metal preservatives	33[c]	11	16	44	16	--	23.9
63. Replacing window panes	38[c]	16	22	33	22	--	24.7
64. Repairing and hanging doors	38[c]	5	27	33	22	--	24.6
65. Repairing wood panels in buildings	38[c]	5	27	38	16	--	23.7
66. Repairing bracings in buildings	38[c]	--	16	50	22	--	27.0
67. Sweeping the floors	55	11	33	22	22	5	25.6
68. Removing trash from work areas	66	5	27	27	22	16	30.8
69. Cutting weeds and grass around buildings	61	16	22	38	22	5	28.7
70. Repairing electrical cords	61	5	11	44	38	--	31.1
71. Cleaning and oiling electric motors	61	--	27	33	38	--	30.5
72. Replacing electrical fuses	55	5	22	33	38	--	30.0
73. Resetting circuit breakers	66	5	22	38	27	--	27.1
74. Repair broken electrical wires	44	--	16	16	50	5	30.5
75. Replacing light bulbs	55	11	38	16	16	11	25.4
76. Replacing light fixtures	33[c]	5	22	33	22	--	23.6
77. Replacing electric motor belts and pulleys	66	5	11	44	27	5	29.2
78. Mixing, pouring, finishing and curing concrete	33[c]	5	16	38	22	--	23.9
79. Building and removing concrete forms	44	5	16	44	16	--	23.3

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=18)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Using Farm Trucks							
80. Loading (manually or mechanically) and securing commodities on truck	88	--	5	22	44	27	38.7
81. Unloading (manually or mechanically) items from truck	83	--	5	38	38	16	35.6
82. Hitching equipment to truck for transport	88	5	--	22	61	11	37.0
83. Securing farm equipment on truck	88	5	5	5	66	11	34.9
84. Observing highway regulations regarding farm trucks	88	--	--	5	55	27	37.0
85. Being familiar with the operator's manual and driving a farm truck in a safe manner	83	--	--	11	61	27	41.2
86. Towing farm equipment	77	5	5	27	44	16	35.2
Performing General Office Procedures							
87. Using telephone	72	--	16	27	50	5	33.8
88. Writing memos, notes and letters	66	--	5	38	33	11	31.1
89. Filing service and operator's manuals	72	--	11	50	38	--	32.4
90. Recording maintenance performed on trucks and equipment	72	--	5	16	61	11	35.7
Using, Maintaining Hand and Power Tools							
91. Selecting appropriate hand tools for a specific job	88	--	5	44	33	16	35.4
92. Selecting appropriate power tools for a specific job	83	--	5	27	38	22	35.3
93. Identifying tools	83	--	11	38	33	16	34.8
94. Storing tools properly	83	--	16	33	27	16	31.9
95. Cleaning tools	83	--	11	33	33	16	33.3
96. Sharpening cutting surfaces on tools	66	5	5	38	38	--	28.1
97. Reconditioning and fitting tools	66	--	5	38	38	--	27.6

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=18)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Observing Safety Precautions							
98. Using fire extinguishers	83	--	--	11	50	38	42.3
99. Wearing appropriate clothing	88	--	--	16	55	27	40.3
100. Interpreting safety symbols	88	--	--	11	55	33	41.8
101. Adjusting safety shields	94	--	--	11	61	27	41.2
102. Using proper lifting and carrying methods	83	--	--	27	55	11	35.6
103. Maintaining clean work areas	83	--	11	22	50	11	34.3
104. Administering minor first aid	83	--	5	27	50	16	37.1
105. Storing inflammable materials safely	83	--	--	5	61	33	42.4

[a]The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b]Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

[c]If less than 40 percent of the respondents declared that the skill was not needed for job entry, the skill is to be reviewed by module developers in order to determine whether such information should be included in modules of instruction.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Operating a Tractor					
1. Safety precautions while operating a tractor	83	--	16	X	
2. Safety and operating instructions	66	--	33	X	
3. Highway regulations in operating farm equipment	72	--	27	X	
4. Tractor starting procedures	55	--	44	X	
5. Basic principles of tractor driving	44	--	55	X	
6. Basic operating principles of a tractor	44	--	55	X	
7. Use of wheel and front end weights	16	16	66		X
8. Use of operating and maintenance manual for a tractor	33	5	61	X	
9. Importance of following manufacturer's recommendations	50	-	50	X	
10. How to connect and tow equipment with a tractor safely	77	--	27	X	
11. How to connect and disconnect a 3 point hitch	44	5	50	X	
12. How to connect and disconnect front end equipment to a tractor	22	22	55		X
13. How to connect and disconnect PTO operated equipment to a tractor	66	--	33	X	
14. Use of hydraulic operated equipment on a tractor	44	--	55	X	
15. Use of safety shields on farm equipment	72	--	27	X	
Operating Tillage Equipment					
16. How to attach soil preparation equipment to the tractor	22	--	77		X
17. Safety measures in operating soil preparation equipment	61	--	38	X	
18. How to adjust soil preparation equipment for maximum operation	50	--	50	X	
19. Basic operating principles of soil preparation equipment	27	5	66		X

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VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
20. Recommended procedures for operating tractor with tillage equipment	33	--	66	X	
21. Reasons for lubricating soil preparation equipment	50	--	50	X	
22. How to detach tillage equipment from tractor	22	16	61		X
23. Recommended procedures for cleaning and storing tillage equipment	27	--	72		X
Operating Fertilizer Equipment					
24. How to attach fertilizer application equipment to the tractor	33	11	55	X	
25. How to calibrate fertilizer application equipment	38	--	61	X	
26. Safety precautions required in applying fertilizer	61	--	38	X	
27. The basic operating principles of fertilizer applicator equipment	33	--	66	X	
28. Manufacturer's specifications for lubrication of fertilizer application equipment	22	--	77		X
29. How to detach fertilizer application equipment	22	11	66		X
30. Procedures for cleaning and storing fertilizer application equipment	38	5	55	X	
Operating Planting Equipment					
31. How to attach planting equipment	44	11	44	X	
32. Safety precautions required during the planting operation	66	5	27	X	
33. Principles of the seed plate	44	16	38	X	
34. How to adjust the planter	66	5	27	X	
35. How to match seed size and seed plate size	50	5	38	X	
36. Procedures for doing the surface method of planting	33	5	61	X	
37. Basic operating principles of planting equipment	33	--	66	X	

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
38. Procedures for operating planting equipment under field conditions	55	--	44	X	
39. Manufacturer's specifications for lubricating planting equipment	44	--	55	X	
40. How to detach planter from tractor	27	11	61		X
41. Recommendations for cleaning and storing planting equipment	33	--	66	X	
Operating Cultivation Equipment					
42. How to attach cultivator to the tractor	16	11	66		X
43. Safety precautions required while cultivating	50	5	38	X	
44. Importance of seeding width and depth to yield	27	16	50		X
45. How to adjust cultivator for appropriate width and depth	38	5	50	X	
46. Basic operating principles of the cultivator	22	--	72		X
47. How to operate the cultivator under field conditions	27	5	61		X
48. Manufacturer's specifications for lubricating cultivation equipment	27	5	61		X
49. How to detach the cultivator from the tractor	11	16	66		X
50. Recommended procedures for cleaning and storing the cultivator	27	5	61		X
Operating Herbicide, Fumigation, Insecticide and Pesticide Applying Equipment					
51. How to attach the chemical applying equipment to the tractor	38	11	50	X	
52. Safety precautions in operating chemical applying equipment	83	5	11	X	
53. How to adjust chemical applying equipment	50	5	44	X	
54. Importance of proper adjustment of chemical applying equipment	50	5	44	X	

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OCCUPATION: FARM EQUIPMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
55. Directions for mixing herbicide, fumigation, insecticide and pesticide chemicals	66	5	22	X	
56. Safety procedures to follow during the mixing and applying of poisonous chemicals	83	5	16	X	
57. How to read label restrictions	88	5	5	X	
58. Understand the basic operating principles of chemical applying equipment	61	--	38	X	
59. How to determine if full coverage is being applied	33	11	55	X	
60. How to record rates and schedules of chemical application	50	11	38	X	
61. Manufacturer's specifications for lubricating chemical applying equipment	33	5	61	X	
62. Recommended procedures for cleaning and storing chemical applying equipment	44	--	55	X	
63. Legal and safety measures required in safe handling and storage of herbicides, fumigation chemicals, insecticides and pesticides	83	--	16	X	
64. Legal requirements in the application of poisonous chemicals	72	5	22	X	
65. How chemical application affects the environment	50	--	50	X	
66. Symptoms of various chemical poisonings	61	--	38	X	
67. Procedures in contacting a local doctor in regard to chemical poisoning	72	--	27	X	
68. Process of removing and disposing of old or non-usable chemicals	61	5	33	X	
69. Procedures for storing chemicals	72	--	27	X	
70. Services of a poison control center	55	16	27	X	

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OCCUPATION: FARM EQUIPMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Operating a Self-Propelled Combine					
71. Basic operating principles of the self-propelled combine	55	5	27	X	
72. How to make adjustments on the self-propelled combine	55	--	33	X	
73. How to remove stones, wire and wood objects from the self-propelled combine	38	5	44	X	
74. How to drive a self-propelled combine	38	11	38	X	
75. Use of the operator's manual in driving and adjusting the self-propelled combine	50	5	33	X	
76. Safety procedures necessary in operating a self-propelled combine	55	5	27	X	
77. Use of the operator's manual in the lubrication of the self-propelled combine	44	--	44	X	
78. How to unload grain from combine into a truck or wagon	16	11	61		X
79. How to transport the grain crop from the field	27	11	50		X
80. How to unload the grain crop at the drier or other appropriate station	27	5	55		X
81. Regulations in driving a self-propelled combine on the highway	55	5	27	X	
82. Basic principles in cleaning and storing a self-propelled combine	33	--	55	X	
Operating Conveying Equipment					
83. Basic operating principles of conveying equipment	22	5	72		X
84. Safety precautions and procedures necessary in operating conveying equipment	27	--	72		X
85. How to adjust belts and pulleys for efficient operation	27	5	66		X
86. Use of operator's manual in lubrication of conveying equipment	27	--	72		X

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OCCUPATION: FARM EQUIPMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Maintaining Buildings and Equipment					
87. Basic fence and gate construction	11	33	55		X
88. How to set up and climb a ladder safely	22	5	72		X
89. Uses of various roofing materials	5	38	55		X
90. Use of various wood and metal preservatives	5	61	33		X
91. Basic principles of surface preparation and preservative application	5	44	50		X
92. How to replace a window pane	--	44	55		X
93. Basic principles of door construction	--	38	61		X
94. How to hang a door	--	33	66		X
95. How to repair wood panels in buildings	--	38	61		X
96. Use of bracings in buildings	--	38	61		X
97. How to sweep the floor	16	38	44		X
98. Safety factors in keeping a clean work area	16	5	77		X
99. How to cut weeds and grass	5	38	55		X
100. How to repair electrical cords	11	11	77		X
101. Simple electrical principles	5	5	88		X
102. Potential dangers to motors when over-lubricated	16	5	77		X
103. How to replace an electrical fuse	38	16	44	X	
104. How to reset circuit breakers	27	16	55		X
105. How to repair broken electrical wires	22	11	66		X
106. How to replace a light bulb	38	22	38	X	
107. How to replace light fixtures	--	27	72		X
108. Basic uses of belts and pulleys with electric motors	27	--	72		X
109. How to choose the correct belt or pulley for a given motor	38	--	61	X	
110. Basic principles of concrete making	11	33	55		X
111. Stages of concrete making	5	33	61		X
112. How to mix and pour concrete	5	27	66		X
113. How to build and use concrete forms	5	27	66		X

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Using Farm Trucks					
114. Uses of various equipment and ramps for loading trucks	27	5	66		X
115. Uses of various equipment and ramps for unloading trucks	27	5	66		X
116. How to hitch various equipment to trucks	38	16	44	X	
117. Use of chain in fastening equipment on a truck	38	--	61	X	
118. Highway regulations regarding operation of farm trucks	61	5	33	X	
119. How to drive a truck in farm operations	61	5	33	X	
120. Safety precautions in towing equipment	61	5	33	X	
121. How to attach equipment for towing	50	11	38	X	
122. How to tow equipment	50	11	38	X	
Performing General Office Procedures					
123. How to use the telephone in a businesslike manner	11	5	77		X
124. Simple business letter writing techniques	11	22	61		X
125. How to write memos and notes in farm grain operations	5	11	77		X
126. Simple filing procedures	5	11	77		X
127. How to keep a record of equipment maintenance	16	--	77		X
Using and Maintaining Hand and Power Tools					
128. Use of various hand tools	16	11	72		X
129. Use of various power tools	16	5	77		X
130. Names of various tools used in the farm operation	16	5	77		X
131. How to store tools properly	27	5	66		X
132. How to clean farm hand and power tools	22	5	72		X
133. Types and uses of various cleaning agents that can be used on metal	22	16	61		X

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
134. Use of grinding wheels, files and stones in sharpening cutting surfaces	27	11	61		X
135. How to recondition and fit tools	11	16	72		X
136. Different classes of fire extinguishers	38	--	61	X	
137. How to use a fire extinguisher	55	5	38	X	
138. What clothing is appropriate for various farm tasks	44	5	50	X	
139. Meaning of various safety symbols	50	5	44	X	
140. How to adjust safety shields	55	--	44	X	
141. How to lift heavy items without bending the back	44	--	55	X	
142. Use of various equipment used in lifting and carrying heavy items	33	5	61	X	
143. Reasons for keeping work areas clean	27	--	72		X
144. Simple first aid procedures	38	--	61	X	
145. How to store inflammable material safely	44	--	55	X	

[a] If 33 percent or more of the respondents indicated a knowledge was "essential", the job knowledge is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Exhibits neatness in --					
1. Handling tools and equipment	16	--	83		X
2. Keeping supplies in order	16	--	83		X
3. The work area and office	11	--	88		X
4. Grooming and dressing appropriately for work	22	--	77		X
5. Setting examples for other employees in terms of working and other personal contacts in the work setting	38	--	61	X	
Shows dependability in --					
6. Completing work on time	55	--	44	X	
7. Arriving to work on time	72	--	27	X	
8. Coming back from "lunch" and "breaks" on time	72	--	27	X	
9. Reporting to the supervisor when there is a need to leave the work area or setting	72	--	33	X	
10. Coming to work regularly	88	--	11	X	
11. Following instructions and carrying out given tasks	77	--	22	X	
12. Reporting to supervisor abnormal situations in the work setting	77	--	22	X	
13. Delegating appropriate responsibility to other employees and making sure the given tasks were performed properly	44	--	55	X	
14. Accepting work setting problem reports and using appropriate supervisory techniques in correcting the problems reported	33	5	61	X	
15. Analyzing personnel problems and using viable supervisory means in solving problems	33	5	61	X	
16. Producing the best quality work	77	--	22	X	
17. Returning promptly all calls	55	--	44	X	
18. Being on time for appointments or calling ahead if detained	72	--	27	X	
19. Accepting and completing jobs assigned	72	--	27	X	
20. Being sure any reports or records are completed	61	--	38	X	
21. Being able to work with minimal supervision	72	--	27	X	
22. Being able to interpret and follow written and verbal directions	66	--	33	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
23. Properly supervising other employees	16	--	83		X
24. Anticipating need for and care of tools, equipment and supplies	27	--	72		X
25. Demonstrating a concern for safety practices	61	--	38	X	
26. Being sure reports are forwarded to the appropriate person	66	--	33	X	
27. Planning and organizing work load	55	--	44	X	
Behaves courteously toward --					
28. Fellow employees	50	--	50	X	
29. Superiors	55	--	44	X	
30. Subordinates	50	--	50	X	
31. Visitors	55	--	44	X	
Is willing to work --					
32. With details	38	--	61	X	
33. With complex problems	38	5	55	X	
34. With routine types of work	38	--	61	X	
35. With tools, machines and equipment	55	--	44	X	
36. With continuous job and work area change	50	--	50	X	
37. Under time pressure	55	11	33	X	
38. Under performance standard pressures	44	5	50	X	
39. On individual tasks for long periods of time	50	--	50	X	
40. On group tasks	44	--	50	X	
41. As a follower	50	5	44	X	
42. As a leader	38	5	55	X	
43. Under normal conditions	33	--	66	X	
44. Under abnormal conditions	44	--	55	X	
45. Things rather than people	33	5	61	X	
46. Performing preventive maintenance	44	--	55	X	
47. Using materials and supplies conservatively	44	--	55	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Confer with visitors in --					
48. Explaining the basic operation of equipment and systems when appropriate	33	5	61	X	
49. Explaining solution to problems when appropriate	27	5	66		X
50. Locating various employees and site areas	22	--	77		X
51. Explaining the institution's policy	11	16	72		X
Becoming involved in --					
52. Using telephone for personal purposes	--	33	61		X
53. Responding to letter inquiries	--	16	77		X
54. Handling information from files	--	11	83		X
55. Releasing information concerning total operations	16	22	55		X
56. Improving ones scope of knowledge and ability	22	5	66		X
57. Technical and professional local associations	--	22	72		X
58. Technical and professional state associations	--	27	66		X
59. Technical and professional national associations	--	33	61		X
60. Public relation activities	11	27	55		X
61. Employee relation activities	11	5	77		X
62. Local, state and federal political activities	5	27	61		X
63. Continuing education and personal upgrading	16	--	77		X
Displays --					
64. Leadership ability	22	5	66		X
65. Accuracy in working	55	--	44	X	
66. Efficient work habits	55	--	44	X	
67. Confidence in working	50	--	44	X	
68. Loyalty toward employer and/or firm	50	--	50	X	
69. Desire to maintain acceptable personal physical condition	50	--	50	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Demonstrates a concern for hazards in terms of --					
70. Safety and health of workers	72	--	27	X	
71. Safety to buildings and equipment	61	--	38	X	
72. Safety to the job	72	--	27	X	
73. Safety and health of visitors	77	--	22	X	
Demonstrates respect for --					
74. Company vehicles and demonstrates safe driving habits	72	--	11	X	

[a] If 33 percent or more of the respondents indicated a behavior was "essential", the behavior is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a behavior was "essential", the behavior is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
1. To be able to perform and apply simple mathematical functions: addition, subtraction, multiplication, division	66	—	33	X	
2. To have a basic understanding of algebra	5	27	66		X
3. To be able to read at a level commensurate with tasks performed	33	--	66	X	
4. To be able to read and comprehend statistical and written data	27	11	61		X
5. To be able to write words and numbers legibly	38	5	55	X	
6. To have good command of the English language	16	11	72		X
7. To be able to perceive color properly (color blind test)	22	11	66		X
8. Has dexterity adequate for the job	38	16	44	X	
9. To be able able to speak pleasantly and courteously in person and on communication devices	27	11	61		X
10. To be familiar with rules of grammar, spelling and punctuation	5	27	66		X
11. To be able to use alphabetic and numeric systems	5	16	77		X
12. To be able to practice good safety measures and use first aid when necessary	50	--	50	X	
13. To be able to use necessary hand power tools at a safe and productive level	33	5	61	X	
14. To be able to read and interpret drawings and specifications	27	11	61		X
15. To be able to make drawings	16	27	55		X
16. To be able to maintain information and cost records for reporting purposes	16	22	61		X
17. To be able to manipulate and assemble parts	33	11	55	X	
18. Has a mechanical aptitude that will allow understanding of basic principles	33	5	61	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
19. Must be able to stand for long periods of time	5	33	61		X
20. Has no physical impairments, such as serious back problems	27	11	61		X
21. Must be able to run basic machine tools	22	11	66		X
22. To have a basic understanding of trigonometry	--	50	50		X
23. To be able to use tools of electrical trade	--	27	72		X
24. To understand the use of all common electrical meters and testing devices	--	33	66		X
25. To be familiar with soldering	--	27	72		X
26. To understand electrical circuits	11	16	72		X
27. Knows Ohms Law and Electrical theory	--	72	27		X
28. Knows AC and DC current	11	16	72		X
29. To understand series and parallel circuits	--	50	50		X
30. To know relays, switches, transformers, capacitors, resistors, generators, batteries and magnetism	--	22	77		X
31. To understand the use of decimals in measuring tolerances and clearances	16	33	50		X
32. To recognize degrees of rotation. (example: 20 degrees)	11	16	72		X
33. To understand and properly complete manufacturer's warranty claim forms	22	22	55		X
34. Possesses good or corrected vision	33	--	66	X	
35. Possesses good or corrected hearing	22	--	77		X
36. To have an understanding of basic physical sciences	5	22	72		X
37. To be able to solve problems related to plane and solid geometry	--	27	--		X
38. To read and interpret common measurement devices, using feet, inches, pounds, ounces, unit rotation	38	11	50	X	
39. To interpolate and extrapolate measurement values	5	44	50		X
40. To estimate and approximate measurements	22	11	66		X

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OCCUPATION: FARM EQUIPMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
41. To convert from one unit to another	11	11	77		X
42. To measure using conventional unit notation: linear (length-distance), weight (ounces-pounds), size (area), and volume (cubic)	38	5	55	X	
43. To read, interpret and use size-scale relationships	11	22	66		X
44. To record measurements using appropriate unit notation	16	22	61		X
45. To read and interpret basic graph relationships	5	33	61		X
46. To measure, compute, and estimate perimeter, areas and volumes	5	38	55		X
47. To read and interpret coefficient measurements	--	50	50		X
48. To read and interpret building trades measurements, specifications, indicated in table form	--	33	66		X
49. To read and interpret board feet measurements	--	27	72		X
50. To read and interpret carpenter's rules and measurements tapes	5	11	83		X
51. To read and interpret building codes	--	44	55		X
52. To read and interpret building permits, and licenses, the forming square, mechanical drawing relationships and orthographic projection views	--	38	61		X
53. To be able to discriminate between two-dimensional and three-dimensional patterns and objects	--	44	55		X
54. To demonstrate eye-hand coordination	22	11	72		X
55. To work or move readily about an elevated frame or structure, with no fear of height	16	16	66		X
56. Maintain balance readily, is physically agile	11	11	77		X
57. Has physical strength and stamina needed to pursue exhausting work	22	11	66		X
58. Knows building trades vocabulary	5	27	66		X

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
59. To be able to use necessary hand tools at a safe and productive level	22	--	72		X
60. To be able to read at a level sufficient to understand and follow directions in equipment manuals and code books	33	--	66	X	
61. To be able to read at a level to interpret labels, directions on labels, and specifications in equipment manuals	33	--	66	X	
62. To understand electrical circuits used on control systems	16	22	61		X
63. To measure accurately to 0.01 inches	5	50	44		X
64. To understand basic operation of physical plant	11	27	61		X
65. To be able to record drawings	5	38	55		X
66. To operate a ten-key adding machine by the "touch system"	5	50	44		X
67. To be able to lift heavy objects	16	22	61		X
68. To be able to compare names and numbers accurately and quickly	11	22	66		X
69. Knows vocabulary of related industry	22	16	72		X
70. To be able to use the alphabetic and numeric system when filing	5	33	61		X
71. To have a basic knowlege of geometry	5	44	50		X
72. To be able to write a clear and to the point letter	5	22	72		X
73. To be able to read and understand a county map	16	5	77		X
74. Is able to measure length to 1/4 of an inch	16	5	72		X
75. Is able to measure length to 1/8 of an inch	16	5	72		X
76. Is able to measure length to 1/16 of an inch	16	11	66		X
77. Is able to measure length to 1/32 of an inch	11	16	72		X
78. Is able to measure temperature to 1°F	11	22	72		X
79. Is able to measure volume by pints	22	5	72		X
80. Is able to measure volume by quarts	27	5	66		X
81. Is able to measure volume by gallons	27	5	66		X

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
82. Is able to measure using a micrometer to .020"	--	44	50		X
83. Is able to measure using a micrometer to .010"	--	50	44		X
84. Is able to measure using a micrometer to .002"	--	50	50		X
85. Is able to maintain a log of time and duration of stay on a job	16	--	83		X
86. Is able to enter cost of items in columns and total them	16	11	72		X
87. Is able to determine sales tax	11	27	61		X
88. Is able to determine time on a job and determine customer labor	22	27	50		X
89. Is able to transfer number sequences from a source to a column	5	22	72		X
90. Is able to add columns of numbers	33	5	61	X	
91. Is able to understand money denominations	27	5	66		X
92. Is able to make change	33	16	50	X	X
93. To be able to lift heavy object; minimum of 75 pounds	27	11	61		X
94. To read and interpret common measurement devices using feet	44	--	55	X	
95. To read and interpret common measurement devices using inches	44	--	50	X	
96. To read and interpret common measurement devices using pounds	44	--	50	X	
97. To read and interpret common measurement devices using ounces	44	5	50	X	
98. To read and interpret common measurement devices using unit rotation	33	16	50	X	
99. To measure using conventional unit notation: linear (length-distance)	44	5	50	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM EQUIPMENT OPERATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
100. To measure using conventional unit notation: weight (ounces-pounds)	44	5	50	X	
101. To measure using conventional unit notation: size (area)	44	11	44	X	
102. To measure using conventional unit notation: volume (cubic)	38	16	44	X	

[a] If 33 percent or more of the respondents indicated a skill was "essential", the skill is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a skill was "essential", the skill is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

TASK ANALYSIS RESULTS FOR FARM MANAGER

VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Grain Crop Program Operation							
1. Establishing an appropriate grain crop rotation	100	-	14	14	50	21	37.5
2. Identifying appropriate tillage practices	100	-	-	28	42	28	39.2
3. Identifying various uses to be made of grain	71	7	14	42	28	-	27.3
Recording Activities for Grain Operators							
4. Recording yields	64	7	-	42	28	21	35.0
5. Recording lime and fertilizer application	85	7	-	14	42	35	39.2
6. Recording chemical application information	85	7	-	7	50	35	40.3
7. Recording dates of planting and harvesting	92	7	-	57	28	14	36.0
8. Notating any unusual events or records	78	7	-	64	21	14	35.3
Establishing Grain Crops							
9. Selecting seed varieties to be planted which are adapted to a given area	100	-	-	21	28	50	42.5
10. Identifying characteristics of various grain plants	71	7	-	50	14	21	31.8
11. Identifying seeds of various grains	85	7	7	35	28	21	34.3
12. Determining seeding rate for various varieties	92	-	-	21	42	35	40.6
13. Determining varieties to be included in the seeding mixture	85	-	-	28	42	28	39.2
14. Determining when to seed	100	-	-	7	35	57	44.6
15. Evaluating advantages and disadvantages of various varieties	92	-	-	35	42	21	37.8

VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
16. Identifying problems related to seeding failures	85	-	-	21	57	14	36.1
17. Determining rates used for seeding	100	-	-	14	50	28	38.2
18. Selecting tillage practices that moderate water absorption and retention	71	-	-	35	42	14	34.3
19. Comparing tillage practices that increase or decrease soil compaction	78	-	-	57	28	7	31.8
20. Identifying tillage practices that may increase or decrease pest problems	85	-	-	50	35	7	32.5
21. Selecting tillage practices that reduce erosion	100	-	7	14	64	7	34.7
22. Evaluating advantages and disadvantages of various planting methods	100	-	-	42	35	14	33.6
23. Determining chemicals needed to destroy ground cover	78	7	7	28	14	35	33.6
24. Determining equipment needed for plowing, disking and harvesting	92	-	-	28	35	28	36.4
Planning the Fertility Program							
25. Taking representative soil samples	78	7	-	21	28	35	35.7
26. Preparing forms to submit with soil sample	78	7	14	28	28	14	30.1
27. Preparing soil to be submitted to testing laboratory	78	7	-	28	50	7	32.6
28. Interpreting soil test results and recommendations	78	-	7	21	35	21	32.2
29. Preparing plant tissues to be submitted	50	14	7	28	21	14	26.6
30. Preparing forms to be submitted with plant tissues	57	14	-	42	21	14	29.4

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
31. Interpreting plant tissue test results	50	7	-	42	35	7	30.8
32. Identifying nutrient deficiency symptoms in growing plants	78	-	7	42	35	14	35.0
33. Determining kinds of fertilizer to apply	100	-	-	14	57	28	41.0
34. Determining kinds of lime to apply	85	-	7	28	35	21	34.3
35. Determining amounts of lime to apply	85	-	-	28	35	28	36.4
36. Determining amounts of fertilizer to apply	92	-	-	21	42	28	37.1
37. Determining when to apply lime and fertilizer	100	-	-	50	28	21	36.7
38. Calculating estimated costs of lime and fertilizer recommendations	85	-	-	42	35	21	37.1
39. Evaluating influence pH level has on nutrient availability	78	-	7	50	28	7	31.1
40. Selecting appropriate methods of applying fertilizer	92	-	-	28	57	14	38.2
41. Identifying specific nutrient requirements for various crops	64	7	-	50	21	14	31.1
42. Determining the frequency of lime and fertilizer applications needed	71	-	7	42	42	7	34.3
43. identifying the effects various nutrients have on grain plant growth	71	-	7	35	28	21	33.6
44. Evaluating influence yields and soil conditions have on fertilization requirements	78	-	-	42	42	7	32.9
45. Selecting the most profitable crop to be grown on particular land for a given purpose	92	-	-	14	57	28	41.0
Preventing and Controlling Diseases and Insects							
46. Identifying common grain crop diseases	78	-	7	35	42	14	35.7
47. Identifying common grain crop insect pests	78	-	-	35	50	14	37.5

VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
48. Inspecting fields to determine when infestation of pests require control	85	7	-	7	64	21	38.9
49. Identifying damage done to grain crops by insect pests and diseases	92	-	-	42	50	7	36.1
50. Selecting appropriate chemicals to control various insect pests and diseases	78	-	-	28	50	21	38.9
51. Determining when to apply chemicals	85	-	-	14	50	35	41.7
52. Determining amount of chemical to apply per acre	78	7	7	-	42	42	39.9
53. Selecting appropriate method to apply chemicals	78	-	-	28	42	28	39.2
54. Evaluating life cycle of insects to determine appropriate control procedures	64	-	-	64	35	-	33.2
55. Determining total amount of chemical required for the operation	78	-	7	21	35	35	39.2
56. Identifying disease and insect resistant varieties for planting	57	7	-	42	35	7	30.8
57. Selecting appropriate crop rotation techniques to reduce problems with diseases and pests	85	-	7	28	57	7	36.1
58. Reducing insect infestations by biological means whenever possible	64	7	-	57	28	7	32.5
59. Evaluating influence of diseases and pests on grain crop production	78	-	-	50	50	-	35.0
60. Identifying various means by which diseases and pests are spread	64	-	21	35	42	-	31.5
Preventing and Controlling Weeds							
61. Identifying common weeds and weed seeds	92	-	-	28	57	14	38.2
62. Inspecting fields to determine when weed infestation requires control	92	-	-	21	57	21	39.6

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
63. Identifying damage done to grain crops by weeds	71	7	-	50	28	14	33.9
64. Selecting appropriate chemical to control weeds	85	7	-	21	50	21	37.5
65. Determining amount of chemical to apply	85	-	-	21	42	35	40.6
66. Determining when to apply chemical	92	-	-	21	57	21	39.6
67. Selecting appropriate method in which chemicals should be applied	85	7	-	28	64	-	34.7
68. Evaluating life cycle of weed plants to determine appropriate control	50	7	7	50	28	-	28.3
69. Determining total amount of chemical needed	78	-	7	28	42	21	37.1
Harvesting Grain Crops							
70. Evaluating influence stages of maturity have on quality and value of grains for storing	71	-	7	14	35	35	37.1
71. Determining when grain crops should be harvested	85	-	-	14	50	35	41.7
72. Observing fields to determine stages of maturity	85	-	-	28	42	28	39.2
73. Determining latest dates for harvesting	64	-	-	57	21	21	36.0
74. Checking weather forecasts	85	-	-	28	57	14	38.2
75. Determining when grain is "field cured" and ready to harvest	85	-	-	21	35	42	41.3
76. Selecting equipment to be used in harvesting grain for maximum efficiency	85	-	-	14	50	35	41.7

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
77. Determining the method of harvesting grain	85	-	-	21	57	21	39.6
78. Comparing the economics of buying, renting or leasing harvesting equipment	85	-	-	35	50	14	37.5
79. Comparing the economics of custom work in harvesting	78	-	7	21	64	7	36.8
80. Determining potential crop losses in quality and quantity for various types of machinery	64	-	14	14	50	14	34.0
81. Checking the field harvesting losses	71	-	-	21	57	21	39.6
82. Estimating the yields	71	-	21	14	50	21	38.9
Storing, Drying and Transporting Grain							
83. Planning the storage of grain	85	-	7	7	64	21	39.6
84. Estimating the amount of storage space needed	85	-	14	-	64	21	38.9
85. Estimating the amount of grain in storage	78	-	7	71	14	7	31.8
86. Determining the safe moisture content for storing grain	78	-	7	21	21	42	37.1
87. Determining the moisture content of grain	78	-	7	14	35	42	40.6
88. Evaluating influence of moisture of grain on value and quality of grain as feed and for sale	64	-	-	35	35	21	35.0
89. Evaluating influence environmental conditions have on type of equipment and facilities needed for drying	50	7	-	28	35	14	30.1
90. Determining capacity of the drying equipment and the time needed to reach desired moisture content in various grain crops	57	7	-	28	42	21	36.4
91. Determining the uses for harvested grain crop	78	7	-	35	42	7	31.5

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
92. Determining transportation needs	85	-	-	42	50	7	36.1
93. Planning the transportation of dried grain to designated site	85	-	7	50	28	14	34.6
94. Checking appropriate forms for completeness after weighing grain	71	-	-	28	64	7	37.5
95. Selecting the equipment for conveying grain to transportation vehicle	78	-	-	35	64	-	36.1
Marketing the Grain Crop							
96. Identifying available grain makets	78	-	-	14	64	21	40.3
97. Determining the time to market the crop for the best return and negotiating and selling the grain crop	78	-	-	7	42	42	39.9
98. Grading the grain crop	50	-	-	57	35	-	31.1
99. Filling out appropriate forms in the marketing process	50	14	-	35	42	7	32.2
100. Marketing the grain crop, arranging for loading, weighing, transporting and unloading the crop	78	-	-	14	64	21	40.3
101. Collecting the appropriate amount of money from the sale of grain crops	78	-	-	7	42	50	43.9
Maintaining Equipment							
102. Interpreting general maintenance directions in equipment operator's manual	85	7	-	7	57	28	39.6
103. Checking farm equipment for proper servicing	92	7	-	7	64	21	38.9
104. Observing operators for proper handling of farm equipment	92	-	-	21	42	42	44.1
105. Preparing a labor calendar	100	-	-	21	35	42	41.3

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OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
106. Identifying peak labor periods	85	-	-	21	42	28	37.1
107. Determining the number of supervisors and workers needed for a given task	85	-	-	28	50	21	38.9
108. Establishing priorities on various jobs to be done	92	-	-	14	28	57	43.9
109. Drawing up a plan to utilize labor efficiently	92	-	-	28	42	28	39.2
110. Calculating measures of labor efficiency	64	-	-	42	42	14	36.4
111. Planning work schedules for supervisors and workers to cover peak and slack labor requirement periods	92	-	-	21	57	21	39.6
112. Judging qualifications of prospective supervisors and workers	85	-	-	21	35	42	41.3
113. Evaluating supervisor's and workers' performance	78	-	-	28	42	28	39.2
114. Assigning specific responsibilities to various supervisors and workers	92	-	-	14	57	28	41.0
115. Establishing pay scales, promotions and benefits for supervisors and workers	92	-	-	14	78	7	38.9
116. Dismissing unsatisfactory supervisors and workers	85	-	-	7	50	42	43.1
117. Hiring desirable supervisors and workers	92	-	-	7	50	42	43.1
118. Planning work loads and conditions so employees have pleasant working conditions	78	-	-	42	28	28	37.8
119. Maintaining good employee-employer relations	92	-	-	28	42	28	39.2
120. Giving instructions rather than dictating orders	92	-	-	21	57	21	39.6
121. Encouraging employees and their families to participate in community activities	50	14	14	42	14	7	25.9
122. Communicating with supervisors and workers	92	-	-	7	57	35	42.4

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
123. Assisting supervisors and workers in securing inservice training	71	7	14	35	35	7	31.5
124. Planning work simplification	78	7	-	50	28	14	33.9
125. Making a list of all safety hazards on the farm	57	7	7	35	14	35	35.7
126. Supervising field supervisors	78	7	-	35	21	35	37.1
Maintaining and Analyzing Farm Records							
127. Entering receipts and expenditures in the appropriate sections	92	7	-	7	28	57	42.5
128. Entering production records in the appropriate section	92	7	-	7	28	57	42.5
129. Computing the net farm income	92	-	-	7	42	50	43.9
130. Computing the net cash income	92	-	-	14	35	50	43.2
131. Computing the gross profits	100	-	-	21	35	42	41.3
132. Computing the net operating income	100	-	-	7	50	42	43.1
133. Computing the management return	85	-	-	28	42	28	39.2
134. Computing the gross value of crops per acre	92	-	-	21	57	21	39.6
135. Computing machinery and power costs per crop acre	71	-	7	35	28	28	37.1
136. Analyzing farm records to determine operation, profit and losses and net worth	100	-	-	14	42	42	42.0
137. Conducting a farm inventory	71	7	-	28	42	21	36.4
138. Preparing a farm operating budget	92	-	-	28	42	28	39.2
139. Conducting farm survey for determining how to reach the maximum operation level	85	-	-	35	42	21	37.8
140. Identifying the strong and weak points of the farm business and taking steps to correct the weak points and improve the strong points	78	-	-	7	71	21	41.0
141. Surveying farm equipment costs and doing an efficiency analysis	85	-	-	28	50	21	38.9

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Determining and Analyzing Farm Credit Needs							
142. Evaluating importance of a good credit rating	92	-	-	14	64	21	40.3
143. Determining returns on borrowed money	92	-	-	7	71	21	41.0
144. Determining credit strengths and weaknesses of the operation	85	-	-	28	50	21	38.9
145. Determining repayment capacity of the farm operation	92	-	-	14	50	35	41.7
146. Determining risk-bearing ability of the farm operation	85	-	-	28	42	28	39.2
147. Evaluating various methods for charging interest on loans	92	-	-	28	64	7	37.5
148. Calculating true interest rates	71	-	-	42	50	7	36.1
149. Developing repayment schedules	85	-	-	28	35	35	39.9
150. Identifying various sources of credit	78	-	-	21	64	14	38.9
151. Determining total least cost credit sources	78	-	-	21	57	21	39.6
152. Planning credit needs on an annual basis	85	-	-	28	28	42	40.6
153. Preparing a credit application	92	-	-	21	57	21	39.6
Purchasing Farm Supplies							
154. Identifying various sources of farm supplies	100	-	-	28	35	35	39.9
155. Determining the amount of supplies to keep on hand and the quantity to order	100	-	-	28	35	35	39.9
156. Determining when to order supplies	100	-	-	28	35	35	39.9
157. Determining the most economical sources of supply	92	-	-	14	42	42	42.0
158. Evaluating the quality of various manufacturer's supplies	100	-	-	14	57	28	41.0
159. Purchasing necessary farm supplies	92	7	-	21	42	28	37.8

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OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
Determining and Fulfilling Farm Taxation Responsibilities							
160. Determining federal, state and local tax obligations	57	14	-	28	35	21	34.3
161. Preparing the appropriate tax forms	57	14	7	21	42	14	32.9
162. Preparing an application for a social security number	64	14	7	35	28	7	28.0
163. Filling out a report of social security tax for a self-employed person	64	14	7	21	42	14	32.9
164. Applying for a refund on non-highway use of the federal and state gasoline tax	71	7	-	50	21	14	31.1
165. Making a plan for practicing income tax management	50	7	7	42	28	7	29.4
166. Preparing a license application for a car or truck	71	14	7	21	28	21	30.8
Determining Farm Insurance Needs							
167. Planning liability insurance for operation of the farm, comparing insurance companies and rates, ordering appropriate liability insurance and paying the premium	78	7	-	28	28	28	34.3
168. Planning fire and windstorm insurance, comparing companies and rates, ordering the appropriate insurance and paying the premium	85	-	-	50	14	28	34.6
169. Planning the coverages and premiums for crop insurance	57	7	7	42	21	7	26.6
170. Planning the coverages and premiums relating to vehicle insurance	85	-	-	57	21	14	32.5
171. Planning the most appropriate types of coverage in, and premiums for, health, accident and disability insurance	71	7	7	35	21	21	31.5

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OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Analyzing and Utilizing Farm Law							
172. Identifying local, state and federal hiring practices	78	7	-	57	14	21	33.9
173. Planning the farm wage contract	71	14	7	14	50	14	34.0
174. Determining employer liability	71	14	-	14	28	35	34.3
175. Reading contracts	92	7	-	28	21	42	38.5
176. Reading negotiable instruments	85	-	-	35	14	42	37.1
177. Identifying respectable lawyers	78	7	14	28	28	14	30.1
178. Determining banking practices appropriate to the farm business	100	-	-	28	42	28	39.2
179. Identifying credit instruments and the role of credit in the farm business	92	7	-	28	35	28	37.1
180. Identifying precautions regarding deeds and abstracts of titles	64	7	7	28	35	14	31.5
181. Identifying legal aspects of farm boundaries, trespassing, fishing, hunting, trapping and other activities relating to property	78	7	7	57	21	7	31.1
182. Identifying legal precautions in regard to tenancy	71	7	7	42	35	7	32.2
183. Identifying legal rights in regard to drainage and water rights	85	7	-	42	42	7	33.6
184. Determining legal precautions relating to pollution regulations as they affect farmers	71	7	-	35	50	7	34.7
185. Determining legal precautions relating to custom work done by farms	85	7	-	28	50	14	36.1

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OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Understanding Governmental Services							
186. Identifying services, grants and loans available to the farmer, from the county, state and federal governments	92	-	7	42	28	21	35.7
187. Determining the types of crop losses the government will reimburse and how to apply for such losses	85	-	7	42	35	14	35.0
188. Identifying the governmental regulatory agencies that influence the farmer's operation	92	-	7	28	42	21	37.1
Performing General Office Procedures							
189. Using telephone	100	-	7	21	14	57	41.8
190. Writing letters	85	-	7	42	14	35	37.1
191. Filing various information	85	7	-	28	35	28	37.1
192. Writing checks	100	-	-	42	14	42	39.2
193. Meeting staff and others to discuss problems and finding solutions	85	7	-	14	35	42	39.9
194. Conducting a business meeting of people engaged in agriculture or agriculture business	42	7	14	50	7	7	24.8
195. Preparing a written analysis of a current agricultural issue, situation or problem	42	7	7	64	-	7	24.8
196. Making an oral presentation of a current agricultural issue, situation or problem before a group of people	50	14	-	50	21	7	28.3
197. Participating as a member of a farmer's organization	78	7	-	78	-	7	27.6
198. Participating in a local community organization	64	14	7	42	14	7	24.5
199. Identifying the services and activities of various farmer's organizations	78	7	7	42	28	7	29.4

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB SKILLS	Percent Indicated Entry Skill[a] (N=14)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance =2; Some Importance = 3; Very Important = 4; Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Planning the Grain Crop					
1. The importance of grain crop rotations	50	-	50	X	
2. How to establish a grain crop rotation	64	-	35	X	
3. How to determine appropriate tillage practices	57	-	42	X	
4. The economics of various tillage practices	64	-	35	X	
5. Various uses of grains	21	21	57		X
6. Economic considerations of various uses of grains	35	21	35	X	
Recording Activities for Grain Operators					
7. How to record yields and dates in a systematic manner	35	-	64	X	
8. Reasons for recording yields and dates	50	-	50	X	
9. Reasons lime and fertilizer application information is important	78	-	21	X	
10. Reasons chemical application information is important	71	-	28	X	
11. Importance of planting and harvesting dates	71	-	28	X	
12. How unusual events can affect the farm business	14	-	85		X
13. Importance of planting the best adapted seed	71	-	28	X	
14. Differences in various varieties of seed	42	-	57	X	
15. Importance of certain characteristics in various grain plants	14	-	85		X
16. How to identify various grain seeds	35	7	57	X	
17. How seeding rate affects yield	71	-	28	X	
18. Reasons different varieties may be included in a seeding mixture	50	-	50	X	
19. How seeding time affects growth and yield	64	-	35	X	
20. The uses of different varieties of grain seeds locally	42	-	57	X	
21. Causes of different types of seeding failures	35	-	64	X	
22. How to determine the number of plants per acre needed for maximum yield	71	-	28	X	
23. Effects of soil water on various grain seeds	64	-	35	X	
24. How soil compaction affects growth of grain seeds	35	-	64	X	

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OCCUPATION: FARM MANAGER

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
25. Life cycles of various pests	14	7	78		X
26. How various tillage practices can affect pest problems	28	-	71		X
27. Damage erosion can cause	64	-	35	X	
28. How to recognize potential erosion problems	57	-	42	X	
29. How to prevent erosion	64	-	35	X	
30. Purposes of various planting methods	57	-	42	X	
31. How to select the most appropriate planting method	64	-	35	X	
32. How chemicals kill ground cover	57	-	42	X	
33. Uses of various brands and kinds of chemicals for killing ground cover	57	-	42	X	
34. Safety practices required in applying dangerous chemicals	85	-	14	X	
35. Effects of chemical application on the ecology	35	-	64	X	
36. Economic principles in determining selection of various tillage equipment and tractors	57	-	42	X	
Planning the Fertility Program					
37. Importance of taking "representative" soil samples	71	-	28	X	
38. How to take representative soil samples	50	-	50	X	
39. How to fill out soil sample forms	42	7	50	X	
40. Where to send a sample	35	-	64	X	
41. Importance of properly preparing soil sample for shipment	28	7	64		X
42. Reasons for sending soil samples to one agency as compared to another	28	-	71		X
43. How to interpret a soil sample analysis	50	7	42	X	
44. Procedures for taking plant tissues	14	-	85		X
45. Where to send the plant tissues for testing	14	-	85		X
46. How to fill out plant tissue forms	14	7	78		X
47. How to interpret plant tissue results	28	7	64		X
48. Meaning of various symptoms in growing plants	42	-	57	X	

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
49. How various trace minerals affect plants under various growing conditions	35	-	64	X	
50. Economic and other factors of different kinds of fertilizer	64	-	35	X	
51. Uses of different kinds of lime	21	7	71		X
52. The meaning of soil pH	71	-	28	X	
53. The relationship of pH to crop growth	78	-	21	X	
54. How to calculate the amount of lime to apply	28	7	64		X
55. How to determine specific yield goals for each crop	50	-	50	X	
56. How to calculate nutrient available from field residue, manure and supplemental fertility materials	35	-	64	X	
57. How to calculate the amount of fertilizer that can be economically applied	57	-	42	X	
58. Importance of the time fertilizer and lime are applied	50	-	50	X	
59. How to calculate the amount of fertilizer and lime required according to the recommendations	42	-	57	X	
60. How to calculate the cost of fertilizer and lime required	50	-	50	X	
61. Influence pH has on nutrient availability	42	-	57	X	
62. Economic and ease of application as factors in determining the method of application	50	7	42	X	
63. Influence yields have on nutrient requirements	50	-	50	X	
64. How to calculate frequency of application of lime fertilizer	57	-	42	X	
65. How various nutrients affect plant growth	50	-	50	X	
66. Factors that affect fertilizer requirements	57	7	35	X	
67. How various yield goals affect fertilizer requirements	50	-	50	X	
68. Cost of production in relation to sale price of various grains	71	7	21	X	
Preventing and Controlling Diseases and Insects					
69. Symptoms of various grain crop diseases	42	-	57	X	
70. Types of damage done by various grain crop insects	35	-	64	X	
71. How to identify various grain crop insects	28	14	57		X
72. How to estimate the amount of damage done by insects	35	7	57	X	

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OCCUPATION: FARM MANAGER

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
73. Cost of controlling the insects	42	-	57	X	
74. The life cycle of insects	21	-	78		X
75. How to estimate the amount of damage done by insects	35	-	64	X	
76. Types of damage done by various pests and diseases	42	-	57	X	
77. Uses of various chemicals available for insect and disease control	71	7	21	X	
78. Types of chemicals appropriate in controlling insects and diseases	35	-	50	X	
79. Effects of poisonous chemicals on the ecology	28	-	64		X
80. Importance of timing in chemical application	71	-	21	X	
81. Manufacturer's recommendations on amount of chemical to apply for effective control	57	7	21	X	
82. Factors in determining different methods of application	28	-	57		X
83. Life cycles of insects in order to determine when chemical application is most effective	42	-	50	X	
84. How to calculate total amount of chemicals required	42	7	42	X	
85. Importance of resistant varieties of grains in the prevention of crop losses	35	-	57	X	
86. Benefits of crop rotations	28	-	64		X
87. How to determine appropriate crop rotations	35	-	64	X	
88. Importance of biological control to ecology	14	7	78		X
89. How to calculate the cost of biological control of insects and diseases	28	7	64		X
90. How to order and utilize insect parasites	28	14	57		X
91. Consequences of serious disease and pest infestations on grain crop yields	42	-	57	X	
92. Means by which diseases and insects multiply	35	7	57	X	

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	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Preventing and Controlling Weeds					
93. Characteristics of common weeds and weed seeds	42	-	57	X	
94. How to determine amount of grain loss by weeds	21	-	78		X
95. Characteristics of plants damaged by weeds	28	-	71		X
96. Uses of various herbicides	71	-	28	X	
97. Effects of herbicides on the ecology		-	71		X
98. Economics of herbicide control of weeds		-	42	X	
99. Manufacturer's recommendations in determining amounts of herbicide required for effective control	64	7	35	X	
100. Stages of growth of common weeds	57	-	42	X	
101. Stages of growth during which the weeds are most economically controlled by herbicides	78	-	21	X	
102. Various methods of economically applying herbicides	50	7	42	X	
103. Stages of growth at which weeds can be controlled by herbicide	71	-	28	X	
104. How to calculate amount of herbicide required per acre and in total	64	7	28	X	
Harvesting Grain Crops					
105. The effects stages of maturity has on moisture content	57	-	42	X	
106. Stages of maturity of various grains	42	-	57	X	
107. Effects various stages of maturity has on storage and quality	64	-	35	X	
108. Consequences of late harvest of grain crops	64	-	35	X	
109. How to schedule harvesting in order to complete on time	71	-	28	X	
110. Importance of knowing the weather conditions in farming	78	-	21	X	
111. How to utilize the various sources of weather forecasts	57	-	42	X	
112. How to determine percentage of moisture in grain	50	7	42	X	
113. How to select the most appropriate method of harvesting	78	-	21	X	
114. Uses of various types of harvesting equipment	57	-	42	X	
115. Economics of various methods of harvesting	71	-	28	X	
116. How to calculate the cost of buying equipment per acre	57	7	35	X	

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	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
117. How to determine when renting equipment is economically feasible	57	-	42	X	
118. Advantages of leasing equipment for harvesting	57	-	42	X	
119. How custom harvesting may fit into the farm operation	57	-	42	X	
120. Operation of various harvesting equipment under different field conditions	64	-	35	X	
121. How to estimate field harvesting losses	50	-	50	X	
122. How to estimate yields	35	7	57	X	
Storing, Drying and Transporting Grain					
123. Conditions under which grains should be stored	85	-	14	X	
124. Considerations necessary to select conveying equipment to storage facilities	35	-	64	X	
125. How to determine the amount of grain to be stored and sold	64	-	35	X	
126. How to calculate cubic feet of storage space	50	-	50	X	
127. Various moisture conditions under which grain will store safely	92	7	-	X	
128. How to test for mositure content of various grains	50	7	42	X	
129. How to estimate moisture content of various grains	21	-	78		X
130. Market requirements of moisture content of various grains	57	-	42	X	
131. How environmental conditons influence moisture content	35	-	64	X	
132. Capacity and efficiency of various drying equipment	57	7	35	X	
133. Understand the basic operating principles of grain drying equipment	42	7	50	X	
134. Manufacturer's recommendations for optimum operation of grain drying equipment	35	7	57	X	
135. Economic considerations regarding various uses of harvested grain crops	35	7	57	X	
136. How to determine various methods of transporting grain and costs of each method	42	-	57	X	

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND					
137. How to contact and arrange transportation needs through various transportation agencies	21	-	78		X
138. Importance of properly completing forms for shipping grain	21	-	78		X
139. Capacity and capabilities of various conveying equipment used in moving grain	28	14	57		X
Marketing Grain					
140. Effect of supply and demand on the markets	78	-	21	X	
141. Reasons for identifying several markets	50	7	42	X	
142. Seasonal price variations	78	-	21	X	
143. The process of negotiating grain prices	50	-	50	X	
144. How to determine the highest prices offered	85	-	14	X	
145. How to close a grain sale deal	71	-	28	X	
146. Influence of price on grade of grain crop	50	-	50	X	
147. How to grade various grains	21	-	78		X
148. Factors affecting various grades of grain	35	-	64	X	
149. The uses of various forms in marketing grain	35	-	64	X	
150. Reasons for determining expense and promptness in selling and transporting grain	35	-	64	X	
151. Importance of handling the income from the sale in a businesslike manner	85	-	14	X	
Maintaining Equipment					
152. How to read operator's manual for various equipment	78	-	21	X	
153. Importance of following operator's manual in maintaining equipment	64	-	35	X	
154. How to inspect various equipment for proper maintenance	78	-	21	X	
155. Optimum operation of various farm equipment	50	-	50	X	
Managing Supervisors and Workers					
156. Role of labor calendar in the grain farm operation	64	-	35	X	

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND					
157. Need to identify peak labor periods	78	-	21	X	
158. How to idenify peak labor periods	78	-	21	X	
159. Work effort and man hours involved in accomplishing various farm tasks	50	-	50	X	
160. Importance of establishing priorities in a farm business	100	-	-	X	
161. The role of various jobs to the total grain operation	50	-	50	X	
162. Results of not completing various jobs	71	-	28	X	
163. Tasks of various farm laborers and supervisors	64	-	35	X	
164. Labor requirements of the entire farm operation	78	-	21	X	
165. How to estimate efficiency of various workers	71	-	28	X	
166. At what times peak and slack work requirements occur	71	-	28	X	
167. How to conduct an interview for prospective workers	71	-	28	X	
168. Qualifications necessary to perform the various tasks	71	-	28	X	
169. Characteristics of a reliable worker	71	-	28	X	
170. How to evaluate worker's performance	64	-	35	X	
171. The importance of effective communication in assigning specific tasks	71	-	28	X	
172. How to determine the abilities of various workers	85	-	14	X	
173. How to read pay scales	50	-	50	X	
174. Legal requirements concerning workers' benefits	64	-	35	X	
175. How to determine a pay scale for various occupations	50	-	50	X	
176. How to establish promotion guidelines	42	-	57	X	
177. Legal requirements to follow in dismissing workers	71	-	28	X	
178. How to write recommendations and job references	35	7	57	X	
179. Legal requirements in hiring new workers	71	-	28	X	
180. How to tell new workers facts relative to the job	71	-	28	X	
181. Steps in introducing a new worker to assignments given	57	-	42	X	
182. Value of worker satisfaction	57	7	35	X	
183. Reasons for fatigue	28	-	71		X
184. Importance of planning individual work schedules	57	-	42	X	

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	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND					
185. Value of good employee-employer relations	50	-	50	X	
186. Negative aspects of dictating orders	42	7	50	X	
187. How to give instructions clearly and effectively	85	-	14	X	
188. Importance of community participation by farm family	21	7	71		X
189. Effective communication techniques	35	-	64	X	
190. Reasons for helping each worker meet his/her capabilities	35	-	64	X	
191. Techniques used in training workers in operating equipment safely	71	-	28	X	
192. How to locate sources of inservice training	28	7	64		X
193. The use of power equipment and tools in work simplification	50	-	50	X	
194. Economics of carrying out various work simplification	42	-	57	X	
195. What constitutes a safety hazard	71	-	28	X	
196. Importance of safety to the grain farm operation	71	-	21	X	
197. Techniques for working effectively with field supervisors	57	-	42	X	
Maintaining and Analyzing Farm Records					
198. Basic record keeping techniques	85	-	14	X	
199. How to maintain production records	78	-	21	X	
200. Concept of net farm income	57	-	42	X	
201. Concept of net cash income	64	-	35	X	
202. Concept of gross profits	57	-	42	X	
203. Concept of net operating income	64	-	35	X	
204. Concept of management return	50	-	50	X	
205. Importance of knowing value of crops per crop acre	78	-	21	X	
206. Role of machinery and power in economics of farm operation	64	-	35	X	
207. How to analyze farm records	78	-	21	X	
208. Use of the farm inventory	50	-	50	X	
209. Techniques of estimating farm costs and income	71	-	28	X	
210. Reasons a farmer may or may not desire to reach maximum farm operation levels at given times	42	-	57	X	
211. What constitutes a strong or weak farm enterprise	57	-	42	X	

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	ESSSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
212. Steps that can be used to improve a weak enterprise	78	-	21	X	
213. How to do an efficiency analysis	42	-	57	X	
214. Reasons for analyzing a farm business for improvement	35	-	64	X	
215. Calculate farm equipment costs	78	-	21	X	
Determine and Analyze Farm Credit Needs/					
216. Importance of a good credit rating	78	-	21	X	
217. Uses of credit ratings	78	-	21	X	
218. Theory of marginal returns	28	-	71		X
219. Comparative analysis of returns on borrowed money	50	-	50	X	
220. How to analyze a farm business for credit strengths and weaknesses	50	-	50	X	
221. How to calculate repayment capacity of a farm operation	64	-	35	X	
222. Reasons for budgeting the use of credit	64	-	35	X	
223. Reasons for self-liquidating loans	42	-	57	X	
224. Net income producing capacity	64	-	35	X	
225. Principle of increasing risk	35	-	64	X	
226. How to calculate the risk-bearing ability of the farm business	35	7	57	X	
227. Reasons for stablizing farm income	50	-	50	X	
228. Various methods of calculating interest charges on farm loans	42	-	57	X	
229. Relationship of interest rates to loan cost	42	-	57	X	
230. How to calculate true interest rates	50	-	50	X	
231. How to determine a repayment schedule	78	-	21	X	
232. Necessity of a repayment schedule on a farm loan	64	-	35	X	
233. Basic uses of credit in the farm business	57	-	42	X	
234. Role of credit institutions in the farm business	28	7	64		X
235. How to determine the sources of farm credit	35	-	64	X	
236. Necessity of least cost credit sources	57	-	42	X	
237. Why credit is planned on an annual basis	42	-	57	X	

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OCCUPATION: FARM MANAGER

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
238. How to prepare a complete credit application	35	-	64	X	
239. How to read a credit application	35	-	64	X	
Purchasing Farm Supplies					
240. Reasons for having various sources of farm supplies	50	-	50	X	
241. How to determine various sources of farm supplies	35	-	64	X	
242. How to calculate how often various supplies should be ordered	50	-	50	X	
243. How to calculate the quantity of supplies to order	64	-	35	X	
244. When and how to order supplies	57	-	42	X	
245. Reasons farm supplies should be available when needed	85	-	14	X	
246. How to determine the most economical sources of supplies	78	-	21	X	
247. Differences in quality of supplies	64	-	35	X	
248. Economic importance of quality differences in supplies	57	-	42	X	
249. How to evaluate quality of various manufacturer's supplies	42	-	57	X	
250. How to purchase and pay for various farm supplies	57	-	42	X	
Determine and Fulfill Farm Taxation Responsibilities					
251. The basic legal obligations of the farm business	71	-	28	X	
252. Reasons for obtaining the most up to date tax information	64	-	35	X	
253. How to follow instructions in preparing tax forms	42	-	57	X	
254. How to prepare an application for a social security number	14	21	64		X
255. How to submit an application for a social security number	14	21	64		X
256. How to prepare a social security tax report	42	14	42	X	
257. How and where to apply for refund on gasoline tax	64	-	35	X	
258. Importance of income tax management	50	-	50	X	
259. How to practice income tax management	42	-	57	X	
260. How to prepare a license application for a truck or car	42	7	50	X	
Determining Farm Insurance Needs					
261. Understand the role of farm liability insurance in the farm business	85	-	14	X	

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	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
262. Differences in companies, rates and kinds of insurance available	42	-	57	X	
263. Types of fire and windstorm damages insurance can protect against and coverages available to cover those risks	50	-	50	X	
264. Uses of crop insurance	28	7	64		X
265. Types of coverages available for vehicle insurance	35	-	64	X	
266. Minimum coverage necessary by law	64	7	28	X	
267. Types of insurance coverage available for health, accident and disability	35	-	64	X	
Analyzing and Utilizing Farm Law					
268. Major legal requirements in regard to hiring farm labor	92	-	7	X	
269. Uses and values of the farm wage contract	28	-	71		X
270. Legal requirements of employer liability	71	-	28	X	
271. How to read contracts	78	-	28	X	
272. How and why to read negotiable instruments before signing	78	-	21	X	
273. How to locate respectable lawyers	35	-	64	X	
274. Various banking practices appropriate to the farm business	64	-	21	X	
275. Use of credit instruments in the grain farm business	57	-	35	X	
276. Use of deeds and abstracts	35	7	50	X	
277. Legal precautions which should be used in regard to property within the state	28	7	57		X
278. Legal precautions in regard to tenancy	35	-	57	X	
279. Legal precautions to take in regard to drainage and water rights	35	-	57		
280. Pollution regulations as they affect the farmer	28	-	64		X
281. How pollution affects the farmers' environment	21	-	78		X
282. Legal precautions which should be used in regard to custom work performed for or by the farmer	50	-	50	X	

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OCCUPATION: FARM MANAGER

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Understanding Governmental Services					
283. How the farmer may apply for the various grants, loans and services available from the county, state and federal governmental agencies	42	-	57	X	
284. Types of losses the farmer may receive reimbursement for and how to apply for such funds	42	7	50	X	
285. How to identify the various governmental regulatory agencies that influence the farm business	35	-	64	X	
Performing General Office Procedures					
286. Businesslike procedures in using the telephone	50	-	50	X	
287. Basic elements of business letter writing	35	-	64	X	
288. Basic filing procedures	42	7	50	X	
289. How to write checks and maintain a record of the balance	71	-	28	X	
290. How to use effective communication techniques	57	-	42	X	
Agricultural Leadership					
291. Parlimentary procedures such as found in Robert's Rules' of Order	14	7	78		X
292. Techniques in writing an analysis of a current problem	28	7	64		X
293. Importance of keeping in touch with current problems in agriculture	50	7	42	X	
294. How to use public speaking techniques	14	7	78		X
295. The role various farmer's organizations play in the farm business	14	-	85		X
296. Importance farmer's organizations are to individual farmers	14	-	85		X
297. Functions of local community organizations	14	7	78		X
298. How a farmer may become acquainted with and join a local community organization	14	14	71		X
299. How to identify services of various farmer's organizations	14	14	71		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]

[a] If 33 percent or more of the respondents indicated a knowledge was "essential", the knowledge is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED	TO BE REVIEWED
Exhibits neatness in --					
1. Handling tools and equipment	7	-	92		X
2. Keeping supplies in order	7	-	92		X
3. The work area and office	7	-	92		X
4. Grooming and dressing appropriately for work	21	-	78		X
5. Setting examples for other employees in terms of working and other personal contacts in the work setting	35	-	64	X	
Shows dependability in --					
6. Completing work on time	64	-	35	X	
7. Arriving to work on time	85	-	14	X	
8. Coming back from "lunch" and "breaks" on time	78	-	21	X	
9. Reporting to the supervisor when there is a need to leave the work area or setting	64	7	28	X	
10. Coming to work regularly	85	-	14	X	
11. Following instructions and carrying out given tasks	71	-	21	X	
12. Reporting to supervisor abnormal situations in the work setting	42	7	50	X	
13. Delegating appropriate responsibility to other employees and making sure the given tasks were performed properly	57	-	42	X	
14. Accepting work setting problem reports and using appropriate supervisory techniques in correcting the problems reported	57	-	42	X	
15. Analyzing personnel problems and using viable supervisory means in solving problems	42	-	57	X	
16. Producing the best quality work	57	-	42	X	
17. Returning promptly all calls	35	7	57	X	
18. Being on time for appointments or calling ahead if detained	78	-	21	X	
19. Accepting and completing jobs assigned	78	-	21	X	
20. Being sure any reports or records are completed	57	-	42	X	
21. Being able to work with minimal supervision	57	-	42	X	
22. Being able to interpret and follow written and verbal directions	78	-	21	X	
23. Properly supervising other employees	71	-	28	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
24. Anticipating need for and care of tools, equipment and supplies	42	-	57	X	
25. Demonstrating a concern for safety practices	64	-	35	X	
26. Being sure reports are forwarded to the appropriate person	71	-	28	X	
27. Planning and organizing work load	78	-	21	X	
Behaves courteously toward --					
28. Fellow employees	57	-	42	X	
29. Superiors	64	-	35	X	
30. Subordinates	57	-	42	X	
31. Visitors	57	-	42	X	
Is willing to work --					
32. With details	50	-	50	X	
33. With complex problems	50	-	50	X	
34. With routine types of work	64	-	35	X	
35. With tools, machines, and equipment	42	7	50	X	
36. With continuous job and work area change	64	-	35	X	
37. Under time pressure	50	-	50	X	
38. Under performance standard pressures	50	-	50	X	
39. On individual tasks for long periods of time	50	7	42	X	
40. On group tasks	57	-	42	X	
41. As a follower	35	14	50	X	
42. As a leader	57	-	42	X	
43. Under normal conditions	71	-	28	X	
44. Under abnormal conditions	64	-	35	X	
45. Things rather than people	42	14	42	X	
46. Performing preventive maintenance	42	7	50	X	
47. Using materials and supplies conservatively	42	-	50	X	
Confer with visitors in --					
48. Explaining the basic operation of equipment and systems when appropriate	35	-	64	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
49. Explaining solution to problems when appropriate	42	-	57	X	
50. Locating various employees and site areas	35	-	64	X	
51. Explaining the institution's policy	35	-	64	X	
Becoming involved in --					
52. Using telephone for personal purposes	7	42	50		X
53. Responding to letter inquiries	21	-	78		X
54. Handling information from files	42	-	57	X	
55. Releasing information concerning total operations	28	21	50		X
56. Improving ones scope of knowledge and ability	50	-	50	X	
57. Technical and professional local associations	14	14	71		X
58. Technical and professional state associations	7	14	78		X
59. Technical and professional national associations	7	7	85		X
60. Public relation activities	7	7	85		X
61. Employee relation activities	35	-	64	X	
62. Local, state and federal political activities	7	42	50		X
63. Continuing education and personal upgrading	35	-	64	X	
Displays --					
64. Leadership ability	57	-	42	X	
65. Accuracy in working	64	-	35	X	
66. Efficient work habits	64	-	35	X	
67. Confidence in working	64	-	35	X	
68. Loyalty toward employer and/or firm	92	-	7	X	
69. Desire to maintain acceptable personal physical condition	57	-	42	X	
Demonstrates a concern for hazards in terms of --					
70. Safety and health of workers	92	-	7	X	
71. Safety to buildings and equipment	85	-	14	X	
72. Safety on the job	78	-	21	X	
73. Safety and health of visitors	85	-	14	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Demonstrates respect for --					
74. Company vehicles and demonstrates safe driving habits	92	-	7	X	

[a]If 33 percent or more of the respondents indicated a behavior was "essential", the behavior is to be accepted and included in the modules.

[b]If less than 33 percent of the respondents declared that a behavior was "essential", the behavior is to be reviewed by module developers to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
1. To be able to perform and apply simple mathematical functions: addition, subtraction, multiplication, division	92	-	7	X	
2. To have a basic understanding of algebra	7	7	85		X
3. To be able to read at a level commensurate with tasks performed	57	-	42	X	
4. To be able to read and comprehend statistical and written data	50	7	42	X	
5. To be able to write words and numbers legibly	64	-	35	X	
6. To have a good command of the English language	57	-	42	X	
7. To be able to perceive color properly. (Color blind test)	35	7	57	X	
8. Has dexterity adequate for the job	42	-	57	X	
9. To be able to speak pleasantly and courteously in person and on communication devices	57	-	42	X	
10. To be familiar with rules of grammar, spelling and punctuation	35	-	64	X	
11. To be able to use alphabetic and numeric systems	50	-	50	X	
12. To be able to practice good safety measures and use first aid when necessary	50	-	50	X	
13. To be able to use necessary hand power tools at a safe and productive level	42	14	42	X	
14. To be able to read and interpret drawing and specifications	50	7	42	X	
15. To be able to make drawings	21	14	64		X
16. To be able to maintain information and cost records for reporting purposes	57	-	42	X	
17. To be able to manipulate and assemble parts	28	14	57		X
18. Has a mechanical aptitude that will allow understanding of basic principles	28	-	71		X
19. Must be able to stand for long periods of time	14	42	42		X
20. Has no physical impairments, such as serious back problems	21	7	71		X
21. Must be able to run basic machine tools	21	21	57		X
22. To have a basic understanding of trigonometry	7	64	28		X
23. To be able to use tools of electrical trade	-	21	78		X
24. To understand the use of all common electrical meters and testing devices	-	42	50		X
25. To be familiar with soldering	-	50	50		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED	TO BE REVIEWED
26. To understand electrical circuits	7	7	85		X
27. Knows Ohms Law and electrical theory	-	28	71		X
28. Knows AC and DC current	14	7	78		X
29. To understand series and parallel circuits	-	21	78		X
30. To know relays, switches, transformers, capacitors, resistors, generators, batteries and magnetism	-	21	78		X
31. To understand the use of decimals in measuring tolerances and clearances	28	7	64		X
32. To recognize degrees of rotation. (example: 10 degrees)	14	21	64		X
33. To understand and properly complete manufacturer's warranty claim forms	28	-	71		X
34. Possesses good or corrected vision	42	-	57	X	
35. Possesses good or corrected hearing	42	-	57	X	
36. To have an understanding of basic physical sciences	21	-	78		X
37. To be able to solve problems related to plane and solid geometry	7	21	28		X
38. To read and interpret common measurement devices, using feet, inches, pounds, ounces, unit rotation	50	-	50	X	
39. To interpolate and extrapolate measurement volume	-	14	85		X
40. To estimate and approximate measurements	14	-	85		X
41. To convert from one unit to another	28	-	64		X
42. To measure using conventional unit notation: linear (length-distance), Weight (ounces-Pounds), size (area) and volume (cubic)	50	-	50	X	
43. To read, interpret, and use size-scale relationships	35	-	64	X	
44. To record measurements using appropriate unit notation	35	-	64	X	
45. To read and interpret basic graph relationships	21	-	78		X
46. To measure, compute, and estimate perimeter, areas and volume	14	-	85		X
47. To read and interpret coefficient measurements	14	14	71		X
48. To read and interpret building trades measurements, specifications, indicated in table form	7	21	71		X
49. To read and interpret board feet measurements	-	14	85		X
50. To read and interpret carpenter's rules and measurements tapes	14	14	71		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRICTICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
51. To read and interpret building codes	14	28	57		X
52. To read and interpret building permits, and licenses, the forming square, mechanical drawing relationships, and orthographic projection views	7	28	64		X
53. To be able to discriminate between two-dimensional and three-dimensional patterns and objects	21	35	42		X
54. To demonstarte eye-hand coordination	35	21	42	X	
55. To work or move readily about an elevated frame or structure, with no fear of height	-	35	64		X
56. Maintain balance readily, is physically agile	7	14	78		X
57. Has physical strength and stamina needed to pursue exhausting work	7	21	71		X
58. Knows building trades vocabulary	-	50	50		X
59. To be able to use necessary hand tools at a safe and productive level	14	14	71		X
60. To be able to read at a level sufficient to understand and follow directions in equipment manuals and code books	50	-	50	X	
61. To be able to read at a level to interpret labels, directions on labels, and specifications in equipment manuals	64	-	35	X	
62. To understand electrical circuits used on control systems	21	14	64		X
63. To measure accurately to 0.01 inches	-	42	57		X
64. To understand basic operation of physical plant	28	7	64		X
65. To be able to record drawings	7	7	85		X
66. To operate a ten-key adding machine by the "touch system"	14	28	57		X
67. To be able to lift heavy objects	7	50	50		X
68. To be able to compare names and numbers accurately and quickly	14	-	85		X
69. Knows vocabulary of related industry	14	7	78		X
70. To be able to use the alphabetic and numeric systems when filing	14	7	78		X
71. To have a basic knowledge of geometry	14	50	42		X
72. To be able to write a clear and to the point letter	21	-	78		X
73. To be able to read and understand a county map	21	-	71		X
74. To be able to measure length to 1/4 of an inch	28	-	71		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
76. Is able to measure length to 1/16 of an inch	28	7	64		X
77. Is able to measure length to 1/32 of an inch	14	14	71		X
78. Is able to measure temperature to 1°F	14	7	78		X
79. Is able to measure volume by pints	30	7	61		X
80. Is able to measure volume by quarts	30	7	61		X
81. Is able to measure volume by gallons	30	7	61		X
82. Is able to measure using a micrometer to .020"	-	46	53		X
83. Is able to measure using a micrometer to .010"	-	53	46		X
84. Is able to measure using a micrometer to .002"	-	61	38		X
85. Is able to maintain a log of time and duration of stay on a job	23	-	76		X
86. Is able to enter cost of items in columns and total them	61	-	38	X	
87. Is able to determine sales tax	38	-	61	X	
88. Is able to determine time on a job and determine customer labor	46	-	53	X	
89. Is able to transfer number sequences from a source to a column	38	-	61	X	
90. Is able to add columns of numbers	69	-	30	X	
91. Is able to understand money denominations	61	-	38	X	
92. Is able to make change	53	7	38	X	
93. To be able to lift heavy object, minimum of 75 pounds	23	30	53	X	
94. To read an interpret common measurement devices using feet	53	-	46	X	
95. To read and interpret common measurement devices using inches	53	-	46	X	
96. To read and interpret common measurement devices using pounds	61	-	38	X	
97. To read and interpret common measurement devices using ounces	46	-	53	X	
98. To read and interpret common measurement devices using unit notation	38	7	53	X	
99. To measure using conventional unit notation: linear (length-distance)	46	7	46	X	
100. To measure using conventional unit notation: weight (ounces-pounds)	46	7	46	X	
101. To measure using conventional unit notation: size (area)	46	7	46	X	
102. To measure using conventional unit notation: volume (cubic)	46	-	46	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FARM MANAGER

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]

[a]If 33 percent or more of the respondents indicated a basic skill was "essential", the skill is to be accepted and included in the modules.

[b]If less than 33 percent of the respondents declared that a basic skill was "essential", the skill is to be reviewed by module developers to determine whether this information should be included in the instructional modules.

TASK ANALYSIS RESULTS FOR FIELD SUPERVISOR

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Establishing Grain Crops							
1. Interpreting information on seed bags	81	--	--	27	36	27	36.0
2. Assisting farm manager in selecting seeds to plant which are adapted to the area	63	18	--	36	9	27	29.7
3. Inoculating seeds	45	27	27	--	18	9	19.8
4. Identifying characteristics of various grain plants	90	--	--	54	36	--	30.6
5. Identifying seeds of various grains	100	--	--	18	54	18	36.0
6. Determining chemical needed to destroy ground cover and instructing operators in the mixing and application of chemicals	90	9	9	18	18	36	33.3
7. Determining tractor size to be used in plowing, disking and harvesting	81	18	9	27	9	27	28.8
8. Determining plowing, disking and harrowing equipment to be used for maximum efficiency	90	9	9	18	27	27	32.4
9. Instructing the equipment operator on the plowing, disking and harrowing operations	100	--	--	36	18	36	36.0
10. Checking planting fields for proper drainage	81	--	9	9	54	18	35.1
11. Determining varieties to be included in the seeding mixture	63	9	9	18	36	18	31.5
12. Determining seeding depth, spacing and rate	100	--	--	9	27	54	40.5
13. Selecting appropriate seeding or planting method(s)	81	9	--	18	27	36	35.1

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
14. Determining when to seed	90	--	--	--	63	36	43.2
15. Determining the tractor size for planting seeds for maximum efficiency	72	--	9	27	27	27	34.2
16. Determining the size and kind of planting equipment for maximum efficiency	90	--	27	9	36	27	36.0
17. Instructing and assisting the equipment operator in adjusting the planting equipment	100	--	--	18	45	36	41.4
18. Determining the speed to travel while planting	90	--	--	18	45	36	41.4
19. Identifying problems related to seeding failures	90	--	--	9	27	63	45.0
20. Distributing seeds to equipment operators	63	27	27	--	18	27	28.8
21. Treating seeds for soil-born diseases	54	18	18	27	9	27	30.6
22. Determining type of tractor and equipment which should be used in cultivating crops and instruct operators in cultivating grain crops	100	--	18	18	18	45	38.7
Planning the Grain Crops Fertility Program							
23. Taking representative soil samples	90	--	--	18	36	45	42.3
24. Preparing forms to submit with soil samples	81	--	18	18	27	36	37.8
25. Preparing soil to be submitted to testing laboratory	90	--	9	18	27	45	40.5
26. Interpreting soil test results and recommendations	90	9	--	--	18	72	44.1
27. Preparing plant tissues to be submitted to testing laboratories	63	27	--	18	18	36	33.3

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
Planning the Grain Crops Fertility Program							
28. Preparing forms to submit with plant tissues	54	27	18	--	27	18	26.1
29. Interpreting plant tissue test results	54	18	18	9	18	27	28.8
30. Identify nutrient deficiency symptoms in growing plants	90	--	--	--	54	36	39.6
31. Interpreting labels on fertilizer bags	90	--	--	9	45	45	43.2
32. Determining kind and amount of fertilizer to apply	81	9	--	--	27	63	43.2
33. Determining kind and amount of lime to apply	81	9	--	--	27	54	38.7
34. Determining when to apply lime and fertilizer	90	--	--	--	90	9	40.5
35. Calculating estimated cost of lime and fertilizer recommendations	81	9	--	27	27	36	37.8
36. Determining influence pH level has on nutrient availability	90	9	9	--	27	54	40.5
37. Selecting appropriate methods of applying fertilizer	81	--	--	36	18	45	40.5
38. Determining the frequency of lime and fertilizer application needed	90	9	--	27	18	45	38.7
39. Evaluating influence yields and soil conditions have on fertilization requirements	54	9	9	18	18	36	33.3
Preventing and Controlling Diseases and Insects							
40. Identifying common grain crop diseases	72	--	--	9	27	54	40.5
41. Identifying common grain crop insect pests	72	--	--	--	45	45	40.5
42. Inspecting fields to determine when infectation of pests require control	90	--	--	--	45	54	45.0

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
43. Identifying damages done to grain crops by insect pests and diseases	81	--	--	27	36	36	40.5
44. Selecting appropriate chemicals to control various insect pests and diseases	72	9	9	18	18	36	33.3
45. Determining when to apply chemicals for controlling insects and pests	63	9	9	9	18	45	35.1
46. Determining amount per acre of chemicals to apply for controlling insects and pests	81	9	--	9	36	36	36.0
47. Reading directions on chemical containers and instructing operators in the mixing of chemicals	100	--	--	9	45	45	43.2
48. Selecting appropriate method and equipment for applying chemicals	81	--	--	45	27	27	37.8
49. Determining total amount of chemicals needed to control insects and diseases	63	9	--	27	27	27	33.3
50. Identifying diseases and insect resistant varieties for planting	81	9	--	27	36	27	36.9
51. Selecting appropriate crop rotations to reduce problems with diseases and pests	72	9	--	18	45	27	37.8
52. Evaluating influence of diseases and pests on grain crop production	81	9	--	9	36	36	36.0
53. Instructing operators in the calibration and application of chemicals	100	--	--	--	45	54	45.0

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
54. Identifying various means by which diseases and pests are spread	45	9	9	27	18	27	31.5
55. Supervising the safe handling and storage of chemicals used to control insects and diseases	90	--	--	9	36	54	44.1
Preventing and Controlling Weeds							
56. Identifying common weeds and weed seeds	81	--	--	--	63	27	38.7
57. Inspecting fields to determine when weed infestation requires control	90	--	--	--	45	45	40.5
58. Identifying damage done to grain crops by weeds	81	--	--	27	27	36	36.9
59. Selecting appropriate herbicides to apply for controlling weeds	81	9	--	9	9	63	38.7
60. Determining amount of herbicides to apply for controlling weeds	81	9	--	9	9	63	38.7
61. Determining when to apply chemicals	72	9	--	--	36	36	33.3
62. Assisting operators in mixing chemicals with appropriate carrier	81	--	--	18	27	45	38.7
63. Selecting appropriate method to apply herbicides	81	--	9	9	54	27	39.6
64. Evaluating life cycles of weed plants to determine appropriate control procedures	54	9	18	18	18	27	30.6
65. Determining total amount of herbicides needed to control weeds	81	9	--	18	36	27	34.2
66. Instructing operators in the calibration and application of herbicides	90	--	--	9	36	45	39.6

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
67. Supervising the safe handling and storing of herbicides	100	--	--	27	18	54	42.3
Harvesting Grain Crops							
68. Evaluating influence stage of maturity has on quality and value of grains for storing	81	--	--	9	36	54	44.1
69. Determining when grain crops should be harvested	90	9	--	9	18	63	42.3
70. Observing fields to determine stages of maturity	90	9	--	--	63	27	39.6
71. Planning the harvesting schedules and determining latest dates for harvesting	90	9	--	27	27	36	37.8
72. Checking weather forecasts	72	9	--	36	27	27	36.0
73. Determining when grain is "field cured" and ready to harvest	100	--	--	9	36	54	44.1
74. Determining the method of harvesting grain	72	9	--	36	9	45	37.8
75. Selecting equipment to be used in harvesting grain for maximum efficiency	81	9	--	27	27	36	37.8
76. Supervising the equipment operator on the harvesting of grain	100	--	--	18	36	45	42.3
77. Assisting operators in the adjustments of harvesting equipment	81	9	--	18	18	45	36.0
78. Planning and directing the transporting of grain from the field to designated site	81	18	--	9	36	36	36.9
79. Assisting operators in unloading grain at designated site	45	36	9	18	18	18	27.0
80. Determining yield	90	--	--	18	36	45	42.3
81. Checking field harvesting losses	90	--	--	18	27	54	43.2

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OCCUPATION: FIELD SUPERVISOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Storing, Drying and Transporting Grain							
82. Planning the storage of grain	63	9	--	27	27	36	37.8
83. Directing the storage of grain	72	--	--	36	36	27	38.7
84. Determining capacity of the drying equipment and time needed to reach desired moisture content in various grain crops	54	18	--	36	--	36	30.6
85. Working closely with the grain drying operator in properly drying grain	63	9	--	27	18	36	34.2
86. Determining transportation needs and supervising loading of dried grains	54	9	9	36	9	27	30.6
87. Supervising the loading of dried grain	54	18	18	9	9	27	25.2
88. Weighing dried grain	54	27	27	18	--	27	27.0
89. Planning the transportation of dried grain to designated site	54	27	9	27	18	18	28.8
90. Checking appropriate forms for completeness	90	--	9	27	27	36	38.7
Maintaining Equipment							
91. Interpreting general maintenance directions in equipment operator's manual	100	--	--	18	45	36	41.4
92. Checking farm equipment for proper servicing	100	--	--	9	36	54	44.1
93. Checking farm equipment for worn or misplaced parts	90	--	9	18	27	45	40.5

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JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
94. Supervising the daily and seasonal storing of farm equipment	90	--	--	36	36	27	38.7
95. Observing operators for proper handling of farm equipment	90	--	--	27	18	54	42.3
Supervising Workers							
96. Identifying peak labor periods	100	--	--	--	45	54	45.0
97. Determining the number of workers needed for a given task	100	--	--	9	27	63	45.0
98. Establishing priorities on various jobs to be done	100	--	--	9	36	54	44.1
99. Planning work schedules for workers to cover peak and slack labor requirement periods	100	--	--	9	36	54	44.1
100. Judging qualifications of prospective hired workers	90	9	--	9	45	36	39.6
101. Training workers to perform various jobs	100	--	--	18	45	36	41.4
102. Evaluating worker's performance	90	9	--	--	45	45	41.4
103. Assigning specific responsibilities to various workers	90	9	--	9	36	45	40.5
104. Assisting farm manager in establishing pay scale, promotion and benefits for workers	72	18	9	18	45	9	31.5
105. Dismissing unsatisfactory workers	63	18	--	9	27	45	37.8
106. Hiring workers	81	9	--	18	27	45	39.6
107. Planning work loads and conditions so employees have pleasant working conditions	63	18	--	27	18	36	35.1

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OCCUPATION: FIELD SUPERVISOR

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
108. Maintaining good employer-employee relations	100	--	--	18	27	54	43.2
109. Giving instructions rather than dictating orders	90	9	--	--	45	45	41.4
110. Encouraging employees and their families to participate in community activities	45	27	9	45	--	18	27.0
111. Communicating with workers	100	--	--	--	36	63	45.9
112. Using appropriate techniques in maintaining good supervisory-employee relations	90	9	--	9	27	54	41.4
113. Assisting workers in securing in-service training	54	18	--	27	27	27	34.2
Purchasing Supplies							
114. Identifying various sources of supplies	63	18	--	27	27	27	34.2
115. Determining the amount of supplies to keep on hand	81	18	--	9	45	27	36.0
116. Determining when to order supplies	81	9	--	27	27	27	33.3
117. Determining the quantity of supplies to purchase at one time	81	9	9	--	45	36	38.7
118. Determining which supplies to order	72	18	--	--	27	45	35.1
119. Comparing costs of supplies from various sources	81	18	--	9	18	54	38.7
120. Evaluating the quality of various manufacturer's supplies	90	--	--	18	36	45	42.3

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JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
The Use of Safety Practices							
121. Instructing workers in the safe handling of hand and power tools	81	9	--	9	27	54	41.4
122. Instructing workers in the importance of wearing appropriate clothing and other protective devices when working	81	9	--	9	36	45	40.5
123. Instructing workers in the safe handling of materials (i.e. seeds, fertilizer, chemicals) which are hazardous to the human body	100	--	--	9	36	54	44.1
Planning the Grain Crop Program Operation							
124. Establishing crop rotation	54	9	--	36	27	27	36.0
125. Identifying appropriate tillage practices	72	9	--	27	27	36	37.8
126. Identifying various uses to be made of grain	63	18	--	18	36	27	35.1
Accounting and Recording Activities for Grain Operations							
127. Recording yields	100	--	9	9	36	45	41.4
128. Record lime and fertilizer application	100	--	--	18	18	63	44.1
129. Record chemical application information (e.g. insecticide, herbicides)	100	--	--	18	18	63	44.1
130. Recording dates of planting and harvesting	100	--	--	18	18	63	44.1
131. Notating any unusual events on records	100	--	9	18	18	54	41.4

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JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=11)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Performing General Office Procedures							
132. Using the telephone	90	9	--	--	27	63	43.2
133. Interviewing applicants	63	9	9	18	27	36	36.9
134. Writing letters	63	9	18	18	18	36	35.1
135. Filing various items of importance	100	--	--	45	18	36	38.7
136. Writing checks	90	--	18	18	9	54	39.6
137. Meeting with various persons to discuss problems	100	--	--	18	27	54	43.2

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category.)

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Establishing Grain Crops					
1. Reasons for accurately reading seed bag labels	54	--	45	X	
2. Maturity time of various varieties of seeds	54	--	45	X	
3. Importance of planting the best adapted seed	63	--	36	X	
4. Reasons for inoculation	36	27	36	X	
5. Procedures for inoculation	18	27	54		X
6. Importance of certain characteristics in various grain plants	18	9	72		X
7. The reasons for identifying various grains	27	--	72		X
8. How chemicals kill ground cover	45	--	54	X	
9. Basic operating principles of chemical applying equipment	63	--	36	X	
10. Safety practices used in mixing and applying dangerous chemicals	81	--	18	X	
11. Uses of various brands and kinds of chemicals	27	--	72		X
12. How to calculate horsepower required to operate various soil preparation equipment	27	27	45		X
13. Various types of tillage equipment used to prepare soil for planting	54	9	36	X	
14. Type of soil preparation necessary for the various grains to be established	54	--	45	X	
15. The relationship between maximum efficiency and cost	54	--	45	X	
16. Basic operating principles of soil preparation equipment	54	9	36	X	
17. Adjustments necessary for maximum efficiency	81	--	18	X	
18. Safety practices to use while plowing, disking, and harrowing	45	--	54	X	
19. Damages caused by standing water in a field	36	9	54	X	
20. Causes of poor drainage	36	9	54	X	
21. Uses of various varieties of grain seeds	18	--	81		X
22. Reasons seeds must be planted in the appropriate manner	54	--	45	X	
23. Functions of various planting equipment	45	9	36	X	
24. The importance of using appropriate planting method(s)	54	--	36	X	

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OCCUPATION: FIELD SUPERVISOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
25. Considerations required in determining the appropriate planting time	36	--	54	X	
26. How to calculate horsepower required to operate planting equipment efficiently	18	18	54		X
27. The economics of planting with various sizes and kinds of equipment	45	--	54	X	
28. The time element involved in planting with various sizes of equipment	27	--	72		X
29. Basic operating principles of planting equipment	45	--	54	X	
30. Reasons for checking planting rate	72	--	27	X	
31. Safety practices to use while planting	45	--	54	X	
32. Reasons for correct planting speed	54	--	45	X	
33. Methods of identifying seeding failures	36	--	63	X	
34. Causes of seeding failure	36	--	63	X	
35. How to calculate the amount of seed required for a given field or days' operation	54	9	36	X	
36. Precautions to follow in protecting seeds during adverse conditions	45	--	54	X	
37. The process of treating seed	18	36	45		X
38. Safety practices to use when treating seed	36	18	45	X	
39. Reasons for treating seed for soil-born diseases	36	18	45	X	
40. Basic operating principles of tractors and how to safely drive them	81	--	18	X	
41. Basic operating principles of cultivators and how to operate them	54	--	45	X	
42. How to calculate amount of horsepower needed to operate given cultivation equipment	36	18	45	X	
43. How to adjust cultivators for optimum efficiency	63	--	36	X	

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Planning the Grain Crop Fertility Program					
44. Reasons for soil testing	63	--	36	X	
45. The importance of knowing when to collect a soil sample	36	9	54	X	
46. Procedures for taking a representative sample	63	--	36	X	
47. How to fill out soil sample forms	54	18	27	X	
48. Where to send a soil sample	36	--	63	X	
49. The importance of properly preparing soil sample for shipment	36	9	54	X	
50. Reasons for sending soil samples to one agency as compared to another	36	36	27	X	
51. How to interpret a soil sample analysis	63	9	27	X	
52. How to determine specific yield goals for each crop	27	--	72		X
53. How to calculate nutrients available from field residue, manure and supplemental fertility materials	18	--	81		X
54. Procedures for taking plant tissues	36	18	45	X	
55. Where to send the plant tissues for testing	36	27	36	X	
56. How to fill out plant tissue forms	18	18	63		X
57. How to interpret plant tissue test results	36	18	45	X	
58. The meaning of various symptoms in growing plants	45	--	54	X	
59. The meaning of the information on fertilizer bags	63	--	36	X	
60. How to calculate the kind and amount of fertilizer required	63	--	36	X	
61. The meaning of soil pH	72	--	27	X	
62. The relationship of soil pH to crop growth	72	--	27	X	
63. How to calculate the amount of lime to apply	63	--	36	X	
64. How to determine the time for lime and fertilizer application	72	--	27	X	
65. The relationship of fertilizer and lime cost to the cost of producing the grain crop	54	--	45	X	

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	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
66. How to make recommendations in order to assist farmers in making decisions	63	--	36	X	
67. How to calculate the cost for making recommendations	45	--	54	X	
68. Influence pH level has on nutrient availability	63	--	36	X	
69. Types of fertilizer and the influences of various methods of application	45	9	45	X	
70. How to calculate frequency of application of lime and fertilizer	54	--	45	X	
71. Influence yields have on nutrient requirements	63	--	36	X	
72. How soil conditions influence fertilizer requirements	54	--	45	X	
73. How to calculate fertilizer requirements for various yield goals	54	--	45	X	
Preventing and Controlling Diseases and Insects					
74. Symptoms of various grain crop diseases	54	--	45	X	
75. How damages are done by various insects	27	--	72		X
76. How to identify common crop insects	36	--	63	X	
77. How to estimate the amount of damage done by insects	36	--	63	X	
78. Cost involved in controlling insects	54	--	45	X	
79. The life cycles of insects	27	9	63		X
80. How to estimate amount of damage uncontrolled insects might do	45	--	54	X	
81. Damage done by insects, pests and diseases	45	--	45	X	
82. Uses of various chemicals available for insect and pest control	45	18	36	X	

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	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
83. Types of chemicals appropriate for controlling insects and pests	36	18	45	X	
84. Effects of poisonous chemicals on the ecology	45	9	45	X	
85. Factors to consider in determining time to apply chemicals	45	--	54	X	
86. Manufacturer's recommendations on amount of chemical to apply for effective control	63	--	36	X	
87. Importance of reading labels on chemical containers	81	--	18	X	
88. Safety practices to follow while mixing chemicals	81	--	18	X	
89. How to teach operators to mix chemicals	72	--	27	X	
90. Basic operating principles of various chemical applying equipment	36	--	63	X	
91. Application requirements of various chemicals	54	--	45	X	
92. How to calculate chemicals required for a given area	54	--	45	X	
93. Importance of resistant varieties of grain seeds	27	--	72		X
94. Seed production of resistant varieties of grain seeds	18	--	81		X
95. Benefits of crop rotations	27	9	63		X
96. How to determine appropriate crop rotations	27	9	63		X
97. Consequences of disease and pest infestations on yields	27	--	72		X
98. How to calibrate chemical applying equipment	72	--	27	X	
99. Means by which diseases and insects multiply	27	--	72		X
100. Safety practices required while handling chemicals	63	--	36	X	
101. The legal requirements of storing dangerous chemicals	45	--	54	X	
102. How to give clear easy to follow instructions	81	--	18	X	

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Preventing and Controlling Weeds					
103. How to identify common weeds and their seeds	36	--	63	X	
104. How to determine when weed control is necessary	81	--	18	X	
105. How to identify damage done by weeds	45	--	54	X	
106. Uses of various herbicides	54	--	45	X	
107. Effects of herbicides on the ecology	54	--	45	X	
108. Manufacturer's recommendations in determining amount of herbicide needed	63	--	36	X	
109. Manufacturer's recommendations in determining when to apply herbicides	72	--	27	X	
110. The use of safety practices in mixing herbicides	72	--	27	X	
111. Manufacturer's steps to follow in mixing herbicides	63	--	36	X	
112. Various methods of applying herbicides	36	--	63	X	
113. Life cycles of common weed plants	36	--	54	X	
114. How to calculate amount of herbicide required to cover given area	63	--	36	X	
115. How to calibrate herbicide equipment	72	--	27	X	
116. Basic operating principles of herbicide application equipment	36	--	63	X	
117. Legal procedures in storing herbicides	45	--	54	X	
118. Safe handling practices concerning herbicides	63	--	36	X	
Harvesting Grain Crops					
119. Stages of maturity of various grains	72	--	27	X	
120. Effects of various stages of maturity on storage and quality	63	--	36	X	
121. Stages of maturity at which each grain crop should be harvested	81	--	18	X	
122. Characteristics of various stages of maturity	63	--	36	X	
123. Reasons for determining harvest dates	63	--	36	X	

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	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
124. Harvest scheduling	63	--	36	X	
125. Meaning and value of weather forecasts	45	--	54	X	
126. The value of field curing grain whenever possible	36	18	45	X	
127. How to determine percentage moisture in grain	54	9	36	X	
128. Various methods of harvesting grain	27	18	54		X
129. How to select the most appropriate method for harvesting	54	9	36	X	
130. How to determine maximum harvesting efficiency	63	9	27	X	
131. Operation of various harvesting equipment	81	--	18	X	
132. Basic operating principles of the harvesting equipment	81	--	18	X	
133. How to adjust the harvesting equipment for maximum efficiency	81	--	18	X	
134. Symptoms of improperly operated equipment	90	--	9	X	
135. Loading procedures of grain from harvesting equipment to a truck	45	9	45	X	
136. How to estimate yield and plan transportation from the field	63	9	27	X	
137. Unloading procedures	36	18	45	X	
138. Importance of knowing yield for determining storage requirements	45	9	45	X	
139. How to determine the yield	72	--	27	X	
140. How to estimate the field harvesting losses	72	--	27	X	
Storing, Drying and Transporting Grains					
141. The conditions under which various grains are to be stored	63	--	36	X	
142. How to calculate the amount of storage required	45	--	54	X	
143. The basic operating principles of the grain storage equipment	36	--	63	X	

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	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
144. Manufacturer's specifications for the operation of grain drying equipment	45	--	54	X	
145. Moisture content required for safe storage and sale	72	--	27	X	
146. How to determine the moisture content of grain	45	9	45	X	
147. The basic operating principles of the grain equipment	45	--	54	X	
148. Importance of properly loading and unloading grain	27	18	54		X
149. How to determine transportation needs	36	9	54	X	
150. The basic operating principles of the loading equipment	27	9	63		X
151. How to weigh dried grain	27	9	63		X
152. How to determine transportation requirements of dried grain	45	9	45	X	
153. The importance of properly completing forms for shipping	45	--	54	X	
154. How to complete appropriate forms	45	--	54	X	
Maintaining Equipment					
155. How to read operator's manuals for various equipment	81	--	18	X	
156. Importance of following operator's manual in maintaining equipment	81	--	18	X	
157. How to maintain servicing records	81	--	18	X	
158. How to inspect various equipment for proper servicing	81	--	18	X	
159. How to make proper adjustments on various equipment	81	--	18	X	
160. When to replace worn parts	90	--	9	X	
161. The importance of proper maintenance and adjustments on equipment for optimum efficiency	90	--	9	X	
162. Conditions under which equipment will be damaged	90	--	9	X	
163. Adequate storage of farm equipment	45	9	45	X	
164. Safety practices and optimum operation of various farm equipment	72	--	27	X	

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	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Supervising Workers					
165. The need to identify peak labor periods	72	--	27	X	
166. How to identify peak labor periods	72	--	27	X	
167. Work effort and man hours involved in accomplishing various farm tasks	72	--	27	X	
168. The importance of establishing priorities	90	--	9	X	
169. The consequences of establishing wrong priorities	81	--	18	X	
170. How to determine various priorities on the farm	81	--	18	X	
171. Reasons for planning work schedules	54	--	45	X	
172. At what times peak and slack work requirements occur	45	--	54	X	
173. How to conduct an interview for prospective workers	45	9	54	X	
174. Qualifications necessary to perform the various tasks for which a new worker is required	45	--	54	X	
175. The characteristics of a reliable worker	63	--	36	X	
176. How to perform various tasks	63	9	36	X	
177. Good teaching procedures to use in training workers to perform various tasks	72	--	27	X	
178. How to evaluate worker's performance	54	--	45	X	
179. Effective communication in assigning specific tasks	72	--	27	X	
180. How to determine the abilities of various workers	63	--	36	X	
181. How to read pay scales	36	18	45	X	
182. Legal requirements concerning worker's benefits	36	18	45	X	
183. How to determine a pay scale for various occupations	27	18	54		X
184. How to establish promotion guidelines	18	--	72		X
185. Legal requirements to follow in dismissing workers	45	--	54	X	
186. Legal requirements to follow in hiring new workers	27	9	63		X
187. The value of worker satisfaction	36	--	63	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
188. Reasons for fatigue	45	9	45	X	
189. Planning of individual work schedules	36	--	63	X	
190. Employer-employee relations as a part of the farm business	63	--	36	X	
191. The value of giving instructions rather than dictating orders	63	--	36	X	
192. How to give instructions clearly and effectively	63	--	36	X	
193. The importance of community participation to a farm worker's family	27	18	54		X
194. Effective communication techniques	45	--	54	X	
195. Reasons for helping each worker meet his/her capabilities	36	--	63	X	
196. Techniques in maintaining good supervisor-employee relations	54	--	45	X	
197. Reasons for developing a method of inservice instruction	36	9	54	X	
198. How to secure inservice training for employees	36	9	54	X	
199. Techniques used to train workers in operating equipment safely	63	--	36	X	
Purchasing Supplies					
200. How to locate sources of supplies	63	--	36	X	
201. How to determine the amount of supplies to keep on hand	72	--	27	X	
202. When to order supplies	54	--	45	X	
203. Basic inventory procedures	36	9	45	X	
204. Basic mathematics for calculating supplies	63	--	36	X	
205. How to develop a list of supplies required	54	--	45	X	
206. The importance of price comparisons	63	9	27	X	
207. Importance of comparing quality of various supplies	54	9	36	X	
208. Techniques for comparing quality of various supplies	45	9	45	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
The Use of Safety Practices					
209. Safety practices to follow while using hand and power tools	81	--	18	X	
210. The meaning of safety symbols	54	--	45	X	
211. The use of protective clothing and devices	63	--	36	X	
212. The safe handling of materials hazardous to the human body	72	--	27	X	
213. Basic first-aid treatment	63	--	36	X	
214. How to read labels of poisonous chemicals for first-aid measures to follow	81	--	18	X	
Planning the Grain Crop Program Operation					
215. The importance of crop rotations	45	9	45	X	
216. How to establish a crop rotation	54	18	27	X	
217. How to determine appropriate tillage practices	54	--	45	X	
218. Various uses to which grains can be put	45	9	45	X	
219. Economic considerations of various uses of grains	54	--	45	X	
Accounting and Recording Activities for Grain Operators					
220. Simple record keeping techniques	63	--	36	X	
221. Importance of accurate records in the farm business	72	--	27	X	
222. Importance of noting unusual events that occur during various farm operations	63	--	36	X	
Performing General Office Procedures					
223. Businesslike procedures in using the telephone	63	9	27	X	
224. Techniques to follow in conducting interviews	45	--	54	X	
225. Basic elements of business letter writing	45	9	45	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
226. How to identify stationery and other materials to use in correspondence	27	36	36		X
227. Basic filing procedures	27	--	72		X
228. How to write a check	54	18	27	X	
229. How to record checks written and calculate balance	63	9	27	X	
230. Effective communication techniques	72	--	27	X	

[a] If 33 percent or more of the respondents indicated a knowledge was "essential", the job knowledge is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Exhibits neatness in --					
1. Handling tools and equipment	54	--	45	X	
2. Keeping supplies in order	54	--	45	X	
3. The work area and office	45	--	54	X	
4. Grooming and dressing appropriately for work	45	--	54	X	
5. Setting examples for other employees in terms of working and other personal contacts in the work setting	81	--	18	X	
Shows dependability in --					
6. Completing work on time	54	--	45	X	
7. Arriving to work on time	72	--	27	X	
8. Coming back from "lunch" and "breaks" on time	72	--	27	X	
9. Reporting to the supervisor when there is a need to leave the work area or setting	54	9	36	X	
10. Coming to work regularly	81	--	18	X	
11. Following instructions and carrying out given tasks	72	--	27	X	
12. Reporting to supervisor abnormal situations in the work setting	72	--	27	X	
13. Delegating appropriate responsibility to other employees and making sure the given tasks were performed properly	72	--	27	X	
14. Accepting work setting problem reports and using appropriate supervisory techniques in correcting the problems reported	45	--	54	X	
15. Analyzing personnel problems and using viable supervisory means in solving problems	45	--	54	X	
16. Producing the best quality work	63	--	36	X	
17. Returning promptly all calls	54	--	45	X	
18. Being on time for appointments or calling ahead if detained	81	--	18	X	
19. Accepting and completing jobs assigned	54	--	45	X	
20. Being sure any reports or records are completed	72	--	27	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED [a]	TO BE REVIEWED [b]
21. Being able to work with minimal supervision	72	--	27	X	
22. Being able to interpret and follow written and verbal directions	90	--	9	X	
23. Properly supervising other employees	54	--	45	X	
24. Anticipating need for and care of tools, equipment and supplies	72	--	27	X	
25. Demonstrating a concern for safety practices	63	--	36	X	
26. Being sure reports are forwarded to the appropriate person	63	--	36	X	
27. Planning and organizing work load	63	--	36	X	
Behaves courteously toward --					
28. Fellow employees	90	--	9	X	
29. Superiors	90	--	9	X	
30. Subordinates	90	--	9	X	
31. Visitors	90	--	9	X	
Is willing to work --					
32. With details	45	9	45	X	
33. With complex problems	54	9	36	X	
34. With routine types of work	45	--	54	X	
35. With tools, machines and equipment	72	--	27	X	
36. With continuous job and work area change	72	--	27	X	
37. Under time pressure	72	--	27	X	
38. Under performance standard pressures	54	--	45	X	
39. On individual tasks for long periods of time	63	--	36	X	
40. On group tasks	72	--	27	X	
41. As a follower	54	--	45	X	
42. As a leader	72	--	27	X	
43. Under normal conditions	63	--	36	X	
44. Under abnormal conditions	72	--	27	X	
45. Things rather than people	36	18	45	X	
46. Performing preventive maintenance	72	--	27	X	
47. Using materials and supplies conservatively	63	9	27	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Confer with visitors in --					
48. Explaining the basic operation of equipment and systems when appropriate	36	--	63	X	
49. Explaing solution to problems when appropriate	63	--	37	X	
50. Locating various employees and site areas	54	--	45	X	
51. Explaining the institution's policy	54	9	36	X	
Becoming involved in --					
52. Using telephone for personal purposes	27	36	36		X
53. Responding to letter inquiries	36	9	54	X	
54. Handling information from files	54	--	45	X	
55. Releasing information concerning total operations	36	27	36	X	
56. Improving ones scope of knowledge and ability	54	--	45	X	
57. Technical and professional local associations	27	9	63		X
58. Technical and professional state associations	27	9	63		X
59. Technical and professional national associations	27	9	63		X
60. Public relation activities	27	18	54		X
61. Employee relation activities	36	--	63	X	
62. Local, state and federal political activities	18	27	54		X
63. Continuing education and personal upgrading	54	--	45	X	
Displays --					
64. Leadership ability	81	--	18	X	
65. Accuracy in working	81	--	18	X	
66. Efficient work habits	90	--	9	X	
67. Confidence in working	81	--	18	X	
68. Loyalty toward employer and/or firm	81	9	9	X	
69. Desire to maintain acceptable personal physical condition	54	--	45	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Demonstrates a concern for hazards in terms of —					
70. Safety and health of workers	72	--	27	X	
71. Safety to buildings and equipment	72	--	27	X	
72. Safety to the job	63	--	36	X	
73. Safety and health of visitors	72	--	27	X	
Demonstrates respect for --					
74. Company vehicles and demonstrates safe driving habits	81	--	--	X	

[a] If 33 percent or more of the respondents indicated a job behavior was "essential", the behavior is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a behavior was "essential", the behavior is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED	TO BE REVIEWED
1. To be able to perform and apply simple mathematical functions: addition, subtraction, multiplication, division	63	--	36	X	
2. To have a basic understanding of algebra	18	--	81		X
3. To be able to read at a level commensurate with tasks performed	54	--	45	X	
4. To be able to read and comprehend statistical and written date	18	--	81		X
5. To be able to write words and numbers legibly	45	--	54	X	
6. To have a good command of the English language	45	--	54	X	
7. To be able to perceive color properly (color blind test)	18	18	63		X
8. Has dexterity adequate for the job	36	--	63	X	
9. To be able to speak pleasantly and courteously in person and on communication devices	45	--	54	X	
10. To be familiar with rules of grammar, spelling and punctuation	36	--	63	X	
11. To be able to use alphabetic and numeric systems	27	--	72		X
12. To be able to practice good safety measures and use first aid when necessary	54	--	45	X	
13. To be able to use necessary hand power tools at a safe and productive level	27	--	72		X
14. To be able to read and interpret drawings and specifications	--	--	100		X
15. To be able to make drawings	--	9	90		X
16. To be able to maintain information and cost records for reporting purposes	27	9	63		X
17. To be able to manipulate and assemble parts	36	--	63	X	
18. Has a mechanical aptitude that will allow understanding of basic principles	45	--	45	X	
19. Must be able to stand for long periods of time	18	45	36		X
20. Has any physical impairments, such as serious back problems	54	9	36	X	
21. Must be able to run basic machine tools	36	9	54	X	
22. To have a basic understanding of trigonometry	9	54	27		X
23. To be able to use tools of electrical trade	18	18	63		X

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VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
24. To understand the use of all common electrical meters and testing devices	--	27	72		X
25. To be familiar with soldering	--	--	100		X
26. To understand electrical circuits	--	--	100		X
27. Knows Ohms Law and electrical theory	--	81	18		X
28. Knows AC and DC current	9	9	81		X
29. To understand series and parallel circuits	9	9	81		X
30. To know relays, switches, transformers, capacitors, resistors, generators, batteries and magnetism		27	72		X
31. To understand the use of decimals in measuring tolerances and clearances	--	27	72		X
32. To recognize degrees of rotation (example: 10 degrees)	9	27	63		X
33. To understand and properly complete manufacturer's warranty claim forms	18	9	72		X
34. Possesses good or corrected vision	45	--	54	X	
35. Possesses good or corrected hearing	54	--	45	X	
36. To have an understanding of basic physical sciences	27	--	63		X
37. To be able to solve problems related to plane and solid geometry	--	18	9		X
38. To read and interpret common measurement devices, using feet, inches, pounds, ounces, unit rotation	45	--	54	X	
39. To interpolate and extrapolate measurement values	9	18	63		X
40. To estimate and approximate measurements	9	--	90		X
41. To convert from one unit to another	--	9	90		X
42. To measure using conventional unit notation: linear (length-distance), weight (ounces-pounds), size (area), and volume (cubic)	18	18	63		X
43. To read, interpret and use size-scale relationships	9	--	81		X
44. To record measurements using appropriate unit notation	18	--	72		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
45. To read and interpret basic graph relationships	18	--	72		X
46. To measure, compute, and estimate perimeter, areas and volumes	9	--	81		X
47. To read and interpret coefficient measurements	--	18	72		X
48. To read and interpret building trades measurements, specifications, indicated in table form	9	9	72		X
49. To read and interpret board feet measurements	9	9	72		X
50. To read and interpret carpenter's rules and measurements tapes	9	--	81		X
51. To read and interpret building codes	--	18	72		X
52. To read and interpret building permits, and licenses, the forming square, mechanical drawing relationships, and orthographic projection views	--	9	81		X
53. To be able to discriminate between two-dimensional and three-dimensional patterns and objects	9	9	72		X
54. To demonstrate eye-hand coordination	36	9	54	X	
55. To work or move readily about an elevated frame or structure with no fear of height	18	18	63		X
56. Maintain balance readily, is physically agile	54	18	27	X	
57. Has physical strength and stamina needed to pursue exhausting work	27	18	54		X
58. Knows building trades vocabulary	--	27	81		X
59. To be able to use necessary hand tools at a safe and productive level	27	--	72		X
60. To be able to read at a level sufficient to understand and follow directions in equipment manuals and code books	36	9	54	X	
61. To be able to read at a level to interpret labels, directions on labels, and specifications in equipment manuals	45	--	54	X	
62. To understand electrical circuits used on control systems	9	18	72		X

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
63. To measure accurately to 0.01 inches	27	18	54		X
64. To understand basic operation of physical plant	9	18	63		X
65. To be able to record drawings	--	9	81		X
66. To operate a ten-key adding machine by the "touch system"	--	27	63		X
67. To be able to lift heavy objects	36	27	36	X	
68. To be able to compare names and numbers accurately and quickly	27	9	63		X
69. Knows vocabulary of related industry	9	--	81		X
70. To be able to use the alphabetic and numeric systems when filing	18	--	72		X
71. To have a basic knowledge of geometry	9	27	54		X
72. To be able to write a clear and to the point letter	27	--	63		X
73. To be able to read and understand a county map	27	--	63		X
74. Is able to measure length to 1/4 of an inch	36	--	54	X	
75. Is able to measure length to 1/8 of an inch	36	--	54	X	
76. Is able to measure length to 1/16 of an inch	36	--	54	X	
77. Is able to measure length ot 1/32 of an inch	27	--	63		X
78. Is able to measure temperature to $1^{o}F$	27	--	63		X
79. Is able to measure volume by pints	27	--	72		X
80. Is able to measure volume by quarts	27	--	72		X
81. Is able to measure volume by gallons	27	--	72		X
82. Is able to measure using a micrometer to .020"	18	18	63		X
83. Is able to measure using a micrometer to .010"	9	18	72		X
84. Is able to measure using a micrometer to .002"	9	27	63		X
85. Is able to maintain a log of time and uration of stay on a job	27	--	72		X
86. Is able to enter cost of items in columns and total them	36	--	63	X	
87. Is able to determine sales tax	18	--	81		X
88. Is able to determine time on a job and determine customer labor	27	--	72	X	
89. Is able to transfer number sequences from a source to a column	36	--	63	X	

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: FIELD SUPERVISOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
90. Is able to add columns of numbers	45	9	45	X	
91. Is able to understand money denominations	36	--	63	X	
92. Is able to make change	36	9	54	X	
93. To be able to lift heavy object; minimum of 75 pounds	27	9	63		X
94. To read and interpret common measurement devices using feet	27	--	72		X
95. To read and interpret common measurement devices using inches	36	--	63	X	
96. To read and interpret common measurement devices using pounds	36	--	63	X	
97. To read and interpret common measurement devices using ounces	36	--	54	X	
98. To read and interpret common measurement devices using unit notation	27	--	63		X
99. To measure using conventional unit notation: linear (length-distance)	27	--	63		X
100. To measure using conventional unit notation: weight (ounces-pounds)	27	--	63		X
101. To measure using conventional unit notation: size (area)	27	--	63		X
102. To measure using conventional unit notation: volume (cubic)	27	--	63		X

[a] If 33 percent or more of the respondents indicated a skill was "essential", the skill is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a skill was "essential", the skill is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

TASK ANALYSIS RESULTS FOR IRRIGATOR

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Determining Feasibility of Irrigating							
1. Examining physical properties of the soil to be irrigated	100	-	-	10	50	40	43.0
2. Measuring available water in the soil with appropriate procedures and tools	80	-	10	30	-	50	36.0
3. Determining total amount of water needed for a given season	60	10	10	10	30	30	33.0
4. Determining when irrigation water needs to be applied	90	-	-	10	10	80	47.0
5. Determining irrigation frequency	90	-	-	10	30	50	40.0
6. Determining amount of water utilized by a given crop during a growing season	60	-	10	10	20	40	33.0
7. Determining amount of water needed for each time irrigating	90	-	-	10	20	60	41.0
8. Determining land yield capacity	70	-	20	10	20	40	35.0
9. Determining how much water is available for irrigating	80	-	10	-	20	50	35.0
10. Determining advantages of irrigating	100	-	30	-	20	50	39.0
11. Determining legal rights to waters in streams and/or lakes	70	-	20	20	10	40	34.0
12. Determining cost of adequate sources of water to operate an irrigation system	70	-	20	10	20	40	35.0
13. Determining quality of water available	60	-	20	10	-	40	27.0
14. Determining need for drainage facilities for an irrigation system	80	-	20	-	30	40	36.0

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equals the sum of the weights of each catetory (Weight for each category is determined by the percentages of responses per category X weighted value of category).

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VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES: NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
15. Determining amount of labor required to operate a sprinkler system	80	-	20	10	20	40	35.0
16. Determining initial cost and operating costs of various types of sprinkler systems	60	-	10	40	-	30	29.0
17. Determining return on investment	60	-	10	20	20	30	31.0
18. Selecting an economical type of irrigation system to meet the needs	60	-	10	10	30	30	32.0
Establishing an Irrigation System							
19. Determining the effect of land slope on the operation of the irrigation system	100	-	-	40	20	40	40.0
20. Leveling land where feasible and economical	50	-	-	20	-	40	26.0
21. Putting in necessary drainage facilities	80	-	10	10	40	30	36.0
22. Determining system layout in cooperation with the equipment selling company	80	-	-	20	20	40	34.0
23. Determining pressure requirements for various systems	90	-	10	30	20	40	39.0
24. Selecting pump and power unit for various systems	70	-	10	20	10	40	32.0

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
25. Overseeing the installation of an irrigation system	90	-	20	30	20	30	36.0
26. Testing the irrigation system	90	-	-	10	20	70	46.0
27. Determining water intake rate of soil and adjust the system accordingly	90	-	-	10	40	50	44.0
28. Determining effect of water tolerance of the plants irrigated	80	-	-	-	40	50	41.0
29. Recognizing erosion caused by irrigation	100	-	-	30	40	30	40.0
Operating Self-Propelled System							
30. Operating the self-propelled irrigation system	90	-	-	-	20	70	43.0
31. Monitoring the gauges	90	-	-	20	-	70	41.0
32. Adjusting the spray bars	90	-	-	10	20	60	41.0
33. Cleaning the spray nozzles	90	-	-	-	40	50	41.0
34. Inspecting and aligning the sprinkler rig	90	-	10	10	20	50	38.0
35. Inspecting the pumps	80	-	10	-	30	40	34.0
36. Operating the pumps	90	-	-	10	30	50	40.0
37. Inspecting channels and spillway for obstructions and erosion	60	-	10	-	40	30	33.0

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Operating Portable Irrigation System							
38. Irrigating crops using a portable irrigating system	100	-	-	10	10	80	47.0
39. Laying out pipes along designated settings	90	-	-	20	10	70	45.0
40. Connecting pipes using appropriate wrench	80	-	10	10	10	60	39.0
41. Attaching vertical pipes to sprinkler heads	90	-	10	20	10	60	42.0
42. Testing the irrigation system by pumping water through it	100	-	10	10	30	50	42.0
43. Observing sprinklers to insure uniform distribution of water	100	-	-	-	20	80	48.0
44. Disassembling system and moving to next location after specified time intervals	100	-	10	10	-	80	45.0
45. Using sprinkler system for applying various chemicals	90	10	0	20	20	50	40.0
46. Using sprinkler system for frost control	90	-	-	10	20	70	46.0
Maintaining a Sprinkler Irrigation System							
47. Providing maintenance to the pumps according to manufacturer's specifications	100	-	-	-	20	80	48.0

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

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OCCUPATION: IRRIGATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
48. Inspecting system periodically for proper operation	100	-	-	10	10	80	47.0
49. Replacing worn parts as required	100	0	10	10	30	50	42.0
50. Inspecting safety devices such as low-pressure and high-temperature cut-off switches	100	-	-	20	10	70	45.0
51. Cleaning foot valves, check valves, debris screens and desilting basins	100	-	-	10	20	70	46.0
52. Adjusting sprinkler heads	100	-	20	-	20	60	42.0
53. Lubricating pumps, motors and gasoline engines according to manufacturer's specifications	100	-	-	10	10	80	47.0
54. Winterizing, protecting from rust and freezing irrigation equipment according to manufacturer's specifications	100	-	-	10	20	70	46.0
55. Replacing electric motors and pulleys	70	-	-	40	20	30	35.0
56. Replacing valves	90	-	-	30	10	50	38.0

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES: NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
Performing General Office Procedures							
57. Using Telephone	80	-	-	40	-	40	32.0
58. Writing letters	50	-	30	-	10	30	25.0
59. Filing various items of information	70	10	10	30	10	30	31.0
60. Ordering parts	70	-	-	40	20	30	35.0
Using Instruments							
61. Using instruments to identify stress conditions of crops	50	10	20	10	-	30	23.0
62. Measuring and computing water flow	60	-	30	10	10	30	28.0
63. Dividing water into desired quantities using various measuring devices	60	-	20	10	10	30	27.0
64. Using leveling instruments, hand level, plaintable, transit for running drainage ditches	60	-	20	10	10	40	31.0
Observing Safety							
65. Wearing appropriate clothing	100	-	-	20	30	50	43.0
66. Identifying potential safety hazards	100	-	-	10	30	60	45.0

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

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OCCUPATION: IRRIGATOR

JOB SKILLS	Percent Indicated Entry Skill[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
General Skills							
67. Identifying various hand and power tools	90	-	20	10	40	30	38.0
68. Selecting appropriate hand and power tools for specific jobs	90	-	10	10	30	50	42.0
69. Storing tools properly	80	-	10	-	40	50	43.0
70. Repairing broken electrical wires	60	10	10	10	20	40	34.0
71. Planning work schedules for workers	60	10	10	-	30	30	30.0
72. Training workers to perform various jobs	60	20	10	10	10	40	31.0
73. Evaluating workers performance	50	20	-	10	20	30	28.0
74. Assigning specific responsibilities to workers	40	30	-	-	20	30	26.0
75. Hiring employees	10[c]	40	10	-	20	-	14.0
76. Firing employees	10[c]	40	10	-	20	-	14.0

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

[c] If less than 40 percent of the respondents declared that the skill was not needed for job entry, the skill is to be reviewed by module developers in order to determine whether such information should be included in modules of instruction.

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Determining Feasibility of Irrigating					
1. Physical properties of various soils	60	10	30	X	
2. Water holding capacity of various soils	60	-	40	X	
3. How natural fertility is important to an irrigation system	30	10	60		X
4. How to use and read available water instruments	30	20	50		X
5. How to estimate moisture content of soil by appearance and texture	50	-	50	X	
6. How to determine location to test soil for moisture content	30	20	50		X
7. How weather affects plant water demands	70	-	30	X	
8. How to estimate water required for a given season	40	30	30	X	
9. Minimum rate of flow of water needed for irrigation	50	-	50	X	
10. Plant symptoms caused by lack of/or too much water	90	-	10	X	
11. Soil moisture level best suited for various crops	70	-	30	X	
12. How to calculate frequency of irrigation	60	-	40	X	
13. How to calculate amount of water various crops utilize in a growing season	30	40	30		X
14. How to calculate amount of water required at each irrigation application	70	-	30	X	

[a] If 33 percent or more of the respondents indicated a knowledge was "essential", the job knowledge is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

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OCCUPATION: IRRIGATOR

	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
15. How to estimate maximum yields for a given crop on various soil conditions	30	20	50		X
16. Effect of climate on available water from various sources	40	20	40	X	
17. How to test a well for water capacity	30	30	40		X
18. How to estimate amount of water flowing in a given stream	30	50	20		X
19. Water rights laws	30	40	30		X
20. How to estimate amount of water available in a pond	30	20	50		X
21. How to calculate economic and other viable advantages of irrigating	30	30	40		X
22. Legal rights of farmers to use water from various sources	30	20	50		X
23. How to calculate cost of constructing an irrigation well	40	30	30	X	
24. How to calculate the cost of pumping water from a distance	40	30	30	X	
25. Effect of the chemical content of water on soil and plants	30	40	30		X
26. Effect of trash, dirt and silt in irrigation water	50	20	30	X	
27. How drainage affects irrigation application	70	-	30	X	
28. How to plan an appropriate drainage system	40	10	50	X	
29. How to estimate labor requirements needed for operating various irrigation systems	50	20	30	X	

[a] If 33 percent or more of the respondents indicated a knowledge was "essential", the job knowledge is to be accepted.

[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
30. How to calculate the initial cost of installing various irrigation systems	30	40	30		X
31. How to calculate the annual depreciation cost of an irrigation system	30	50	20		X
32. How to calculate the annual operating cost of an irrigation system	40	30	30	X	
33. How to compare initial costs and operating expenses on various types of sprinkler irrigation systems	30	30	40		X
34. How to calculate return investment on an irrigation system	40	40	20	X	
Establishing an Irrigation System					
35. How to determine slope of land using appropriate instruments	30	30	40		X
36. How land slope affects the selection of an irrigation system	40	30	30	X	
37. How to calculate the cost of land leveling	30	60	10		X
38. How to level land with various equipment	30	30	40		X
39. How to install drainage tile	30	30	40		X
40. How to construct water ways for run-off	30	10	60		X

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MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
41. How to construct irrigation channels when appropriate	50	20	30	X	
42. Various irrigation system layouts and the cost and efficiency of each	30	30	40		X
43. How to calculate pressure requirements of various sprinkler irrigation systems	50	10	40	X	
44. Uses and capacity of various types and sizes of pumps	40	10	50	X	
45. Basic operating principles of pumps	60	-	40	X	
46. How to select the appropriate power unit	60	-	40	X	
47. Basic operating principles of electric motors	40	20	40	X	
48. Basic operating principles of gasoline engines used on irrigation pumps	50	10	40	X	
49. How to find sources of technical advice regarding irrigation and drainage systems	50	20	20	X	
50. How to install an irrigation system	60	-	30	X	
51. How to read and interpret manufacturer's instructions regarding installation of an irrigation system	60	10	30	X	
52. How to safely test a sprinkler irrigation system	70	-	30	X	

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
53. How to determine the water intake rate of various soils	70	-	30	X	
54. How to adjust the sprinkler system for various amounts of water flow	80	-	20	X	
55. Principle of water tolerance	50	10	40	X	
56. Effects of water erosion	60	-	40	X	
57. Signs of early soil erosion	50	-	50	X	
Operating a Self-Propelled System					
58. Basic operating principles of the self-propelled system	80	-	10	X	
59. Safety procedures required in operating a self-propelled system	80	-	10	X	
60. Basic principles of gauges	70	-	20	X	
61. How to adjust spray bars on self-propelled systems	70	-	20	X	
62. Procedures for cleaning the spray nozzles	80	-	10	X	
63. How to align the sprinkler rig	70	-	20	X	
64. Basic operating principles of irrigation pumps	60	-	30	X	
65. Use of the operator's manual in operating irrigation pumps	60	-	30	X	
66. Reasons for having channels and spillways in the irrigation system	60	10	20	X	

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[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowlege is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
67. Steps that can be taken to eliminate erosion	40	10	40	X	
68. How to properly maintain channels and spillways	40	10	40	X	
Operating Portable Irrigation Systems					
69. Basic operating principles of the portable sprinkler system	90	-	10	X	
70. Safety procedures required in operating portable irrigation equipment	100	-	-	X	
71. Basic designs of various portable irrigation systems	40	20	40	X	
72. How to use hand tools in assembling and disassembling portable piping equipment	70	-	30	X	
73. How to attach vertical pipes to sprinkler heads	70	-	30	X	
74. How to safely test the portable irrigation system	90	-	10	X	
75. How to check for uniform distribution of water by the sprinkler heads	80	-	20	X	
76. Steps in moving portable irrigation systems	80	-	20	X	
77. Advantages of chemical application through a sprinkler irrigation system	30	20	50		X
78. Basic operating principles in applying chemicals in the irrigation water	30	20	50		X

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[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
79. Ways sprinkler irrigation can be used for frost protection	70	-	30	X	
80. Use of the operator's manual in the lubrication and maintenance of pumps, motors and gasoline engines	90	-	10	X	
81. Why and how to repair or replace worn parts	70	-	30	X	
82. Basic operating principles of various safety devices	70	-	30	X	
83. Reasons for placement of foot valves, check valves, debris screens and desilting basins in the system	70	-	30	X	
84. How to adjust sprinkler heads for uniform distribution of water	80	-	20	X	
85. Manufacturer's recommendations for winterizing and protecting irrigation equipment from rust	80	-	20	X	
86. How to replace an electric motor	40	10	50	X	
87. Basic principles and uses of pulleys	40	20	40	X	
88. How to replace valves in a sprinkler irrigation system	60	-	40	X	
Performing General Office Procedures					
89. The businesslike use of the telephone	30	10	60		X
90. How to write business letters	30	20	50		X
91. Simple filing procedures	30	30	40		X
92. How to fill out an order blank	30	20	50		X
93. How to determine the part number and name	50	10	40	X	
94. How to order parts and supplies	40	20	40	X	

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Using Instruments					
95. Basic uses of various instruments to identify stress conditions of crops	30	50	20		X
96. Uses of various instruments for measuring water flow	30	40	30		X
97. How to compute water flow	30	30	40		X
98. How to measure amount of water available for irrigation	40	10	50	X	
99. How to use various measuring devices to measure water	30	30	40		X
100. Basic drainage principles	40	20	40	X	
101. How to use leveling instruments, hand levels, plaintables and transits	30	30	40		X
102. How to place the stakes for layout of a drainage ditch	30	40	30		X
Observing Safety					
103. The importance of wearing appropriate clothing for various jobs	80	-	20	X	
104. Dangers of various potential safety hazards	90	-	10	X	
105. How to identify potential safety hazards	90	-	10	X	

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JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
General Skills					
106. How to identify various hand and power tools	30	-	70		X
107. Uses of various hand and power tools	30	-	70		X
108. The importance of using safety procedures in working with various hand and power tools	60	-	40	X	
109. How to safely store tools	40	-	60	X	
110. How to make simple electrical repairs	40	10	50	X	
111. Simple soldering techniques	40	-	60	X	
112. Uses of electrical tape	40	-	60	X	
113. How to plan work schedules	40	10	50	X	
114. How to use successful teaching techniques	30	40	30		X
115. How to develop step by step procedures for performing various tasks	40	-	60	X	
116. How to use various tests to evaluate workers performance	40	10	50	X	
117. How to make an evaluation of worker performance based on observation	40	10	50	X	
118. How to determine worker's abilities	40	20	40	X	
119. How to assign work in a businesslike manner	30	-	70		X
120. How to hire employees	10	50	40		X

[a] If 33 percent or more of the respondents indicated a knowledge was "essential", the job knowledge is to be accepted.

[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

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OCCUPATION: IRRIGATOR

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
121. Legal considerations in hiring employees	20	40	40		X
122. How to evaluate recommendations and tests used in hiring	20	50	30		X
123. Legal considerations in firing employees	10	50	40		X
124. How to dismiss an employee in an appropriate manner	10	40	50		X

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[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

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OCCUPATION: IRRIGATOR

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Exhibits neatness in --					
1. Handling tools and equipment	50	-	50	X	
2. Keeping supplies in order	50	-	50	X	
3. The work area and office	40	0	60	X	
4. Grooming and dressing appropriately for work	50	10	40	X	
5. Setting examples for other employees in terms of working and other personal contacts in the work setting	60	-	40	X	
Shows dependability in --					
6. Completing work on time	60	-	40	X	
7. Arriving to work on time	90	-	10	X	
8. Coming back from "lunch" and "breaks" on time	80	-	20	X	
9. Reporting to the supervisor when there is a need to leave the work area or setting	70	-	30	X	
10. Coming to work regularly	100	-	-	X	
11. Following instructions and carrying out given tasks	80	-	20	X	
12. Reporting to supervisor abnormal situations in the work setting	70	-	30	X	
13. Delegating appropriate responsibility to other employees and making sure the given tasks were performed properly	50	10	40	X	
14. Accepting work setting problem reports and using appropriate supervisory techniques in correcting the problems reported	40	-	60	X	
15. Analyzing personnel problems and using viable supervisory means in solving problems	30	10	60		X
16. Producing the best quality work	80	-	20	X	

[a] If 33 percent or more of the respondents indicated a behavior was "essential", the behavior is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a behavior was "essential", the behavior is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

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OCCUPATION: IRRIGATOR

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
17. Returning promptly all calls	60	-	40	X	
18. Being on time for appointments or calling ahead if detained	70	10	20	X	
19. Accepting and completing jobs assigned	90	-	10	X	
20. Being sure any reports or records are completed	60	10	30	X	
21. Being able to work with minimal supervision	60	-	40	X	
22. Being able to interpret and follow written and verbal directions	70	-	30	X	
23. Properly supervising other employees	50	10	40	X	
24. Anticipating need for and care of tools, equipment and supplies	50	-	50	X	
25. Demonstrating a concern for safety practices	70	-	30	X	
26. Being sure reports are forwarded to the appropriate person	60	-	40	X	
27. Planning and organizing work load	60	-	40	X	
Behaves courteously toward --					
28. Fellow employees	80	-	20	X	
29. Superiors	80	-	20	X	
30. Subordinates	80	-	20	X	
31. Visitors	80	-	20	X	
Is willing to work --					
32. With details	50	-	50	X	
33. With complex problems	40	-	60	X	
34. With routine types of work	70	-	30	X	
35. With tools, machines and equipment	70	-	30	X	
36. With continuous job and work area change	70	-	30	X	

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[b] If less than 33 percent of the respondents indicated that a behavior was "essential", the behavior is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
37. Under time pressure	80	-	20	X	
38. Under performance standard pressures	60	-	40	X	
39. On individual tasks for long periods of time	60	-	40	X	
40. On group tasks	60	-	40	X	
41. As a follower	60	-	40	X	
42. As a leader	50	-	50	X	
43. Under normal conditions	60	-	40	X	
44. Under abnormal conditions	70	-	30	X	
45. Things rather than people	60	20	20	X	
46. Performing preventive maintenance	50	-	50	X	
47. Using materials and supplies conservatively	60	-	40	X	
Confer with visitors in --					
48. Explaining the basic operation of equipment and systems when appropriate	30	-	70		X
49. Explaining solution to problems when appropriate	30	-	70		X
50. Locating various employees and site areas	40	10	50	X	
51. Explaining the institution's policy	30	20	50		X
Becoming involved in --					
52. Using telephone for personal purposes	30	50	20		X
53. Responding to letter inquiries	30	20	50		X
54. Handling information from files	30	30	40		X

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MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
55. Releasing information concerning total operations	30	40	30		X
56. Improving ones scope of knowledge and ability	50	-	50	X	
57. Technical and professional local associations	40	20	40	X	
58. Technical and professional state associations	40	20	40	X	
59. Technical and professional national assocations	30	40	30		X
60. Public relation activities	30	30	40		X
61. Employee relation activities	40	10	50	X	
62. Local, state and federal political activities	30	50	20		X
63. Continuing education and personal upgrading	50	-	50	X	
Displays --					
64. Leadership ability	40	10	50	X	
65. Accuracy in working	70	-	30	X	
66. Efficient work habits	70	-	30	X	
67. Confidence in working	60	-	40	X	
68. Loyalty toward employer and/or firm	70	-	30	X	
69. Desire to maintain acceptable personal physical condition	80	-	20	X	
Demonstrates a concern for hazards in terms of --					
70. Safety and health of workers	90	-	10	X	
71. Safety to buildings and equipment	90	-	10	X	
72. Safety to the job	90	-	10	X	
73. Safety and health of visitors	90	-	10	X	
Demonstrates respect for --					
74. Company vehicles and demonstrates safe driving habits	80	-	20	X	

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MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
1. To be able to perform and apply simple mathematical functions: addition, subtraction, multiplication, division	70	-	30	X	
2. To have a basic understanding of algebra	20	30	50		X
3. To be able to read at a level commensurate with tasks performed	70	10	20	X	
4. To be able to read and comprehend statistical and written data	50	-	50	X	
5. To be able to write words and numbers legibly	60	-	40	X	
6. To have a good command of the English language	30	10	60		X
7. To be able to perceive color properly (color blind test)	10	10	80		X
8. Has dexterity adequate for the job	50	-	50	X	
9. To be able to speak pleasantly and courteously in person and on communication devices	50	-	50	X	
10. To be familiar with rules of grammar, spelling and punctuation	10	20	70		X
11. To be able to use alphabetical and numeric systems	30	-	70		X
12. To be able to practice good safety measures and use first aid when necessary	50	-	50	X	
13. To be able to use necessary hand power tools at a safe and productive level	40	-	60	X	
14. To be able to read and interpret drawings and specifications	10	-	90		X
15. To be able to make drawings	10	30	60		X
16. To be able to maintain information and cost records for reporting purposes	10	10	80		X

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[b] If less than 33 percent of the respondents declared that a basic skill was "essential", the skill is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
17. To be able to manipulate and assemble parts	50	-	50	X	
18. Has a mechanical aptitude that will allow understanding of basic principles	30	-	70		X
19. Must be able to stand for long periods of time	30	20	50		X
20 Has no physical impairments, such as serious back problems	50	-	50	X	
21. Must be able to run basic machine tools	30	-	70		X
22. To have a basic understanding of trigonometry	10	60	30		X
23. To be able to use tools of electrical trade	10	20	70		X
24. To understand the use of all common electrical meters and testing devices	10	40	50		X
25. To be familiar with soldering	10	-	90		X
26. To understand electrical circuits	20	30	50		X
27. Knows Ohms Law and electrical theory	10	70	20		X
28. Knows AC and DC current	10	20	70		X
29. To understand series and parallel circuits	10	50	40		X
30. To know relays, switches, transformers, capacitors, resistors, generators, batteries and magnetism	10	30	60		X
31. To understand the use of decimals in measuring tolerances and clearances	10	30	60		X
32. To recognize degrees of rotation (example: 10 degrees)	10	20	70		X
33. To understand and properly complete manufacturer's warranty claim forms	10	20	70		X

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MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
34. Possesses good or corrected vision	40	-	60	X	
35. Possesses good or corrected hearing	40	-	60	X	
36. To have an understanding of basic physical sciences	10	30	60		X
37. To be able to solve problems related to plane and solid geometry	-	20	50		X
38. To read and interpret common measurement devices, using feet, inches, pounds, ounces, unit rotation	40	10	50	X	
39. To interpolate and extrapolate measurement values	10	20	70		X
40. To estimate and approximate measurements	30	-	70		X
41. To convert from one unit to another	10	10	80		X
42. To measure using conventional unit notation: linear (length-distance), weight (ounces-pounds), size (area), and volume (cubic)	30	10	60		X
43. To read, interpret and use size-scale relationships	20	-	80		X
44. To record measurements using appropriate unit notation	10	10	80		X
45. To read and interpret basic graph relationships	10	20	70		X
46. To measure compute and estimate perimeter, areas and volumes	10	30	60		X
47. To read and interpret coefficient measurements	10	50	40		X
48. To read and interpret building trades measurements, specifications, indicated in table form	10	40	50		X
49. To read and interpret board feet measurements	10	40	50		X
50. To read and interpret carpenter's rules and measurements tapes	10	-	90		X

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MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
51. To read and interpret building codes	10	50	40		X
52. To read and interpret building permits, and licenses, the forming square, mechanical drawing relationships and orthographic projection views	10	50	40		X
53. To be able to discriminate between two-dimensional and three-dimensional patterms and objects	10	30	60		X
54. To demonstrate eye-hand coordination	20	-	80		X
55. To work or move readily about an elevated frame or structure, with no fear of height	10	20	70		X
56. Maintain balance readily, is physically agile	20	10	70		X
57. Has physical strength and stamina needed to pursue exhausting work	40	-	60	X	
58. Knows building trades vocabulary	10	40	50		X
59. To be able to use necessary hand tools at a safe and productive level	30	-	70		X
60. To be able to read at a level sufficient to understand and follow directions in equipment manuals and code books	40	-	60	X	
61. To be able to read at a level to interpret labels, directions on labels and specifications in equipment manuals	50	-	50	X	
62. To understand electrical circuits used on control systems	20	50	30		X
63. To measure accurately to 0.01 inches	10	50	40		X
64. To understand basic operation of physical plant	10	20	70		X
65, To be able to record drawings	10	50	40		X
66. To operate a ten-key adding machine by the "touch system"	10	60	30		X
67. To be able to lift heavy objects	30	10	60		X

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MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
68. To be able to compare names and numbers accurately and quickly	10	20	70		X
69. Knows vocabulary and related industry	20	-	80		X
70. To be able to use the alphabetic and numberic systems when filing	10	20	70		X
71. To have a basic knowledge of geometry	10	40	50		X
72. To be able to write a clear and to the point letter	10	30	60		X
73. To be able to read and understand a county map	10	20	70		X
74. Is able to measure length to ¼ of an inch	30	20	50		X
75. Is able to measure length to 1/8 of an inch	30	20	50		X
76. Is able to measure length to 1/16 of an inch	30	30	40		X
77. Is able to measure length ot 1/32 of an inch	10	40	50		X
78. Is able to measure temperature to 1°F	30	10	60		X
79. Is able to measure volume in pints	10	10	80		X
80. Is able to measure volume in quarts	20	10	70		X
81. Is able to measure volume by gallons	20	-	80		X
82. Is able to measure using a micrometer to .020"	10	60	30		X
83. Is able to measure using a micrometer to .010"	10	60	30		X
84. Is able to measure using a micrometer to .002"	10	60	30		X
85. Is able to maintain a log of time and duration of stay on a job	30	30	40		X
86. Is able to enter cost of items in columns and total them	20	30	50		X

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MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURAL RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: IRRIGATOR

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
87. Is able to determine sales tax	10	50	40		X
88. Is able to determine time on a job and determine customer labor	20	20	60		X
89. Is able to transfer number sequences from a source to a column	20	30	50		X
90. Is able to add columns of numbers	20	10	70		X
91. Is able to understand money denominations	10	20	70		X
92. Is able to make change	20	20	60		X
93. To be able to lift heavy objects; minimum of 75 pounds	30	10	60		X
94. To read and interpret common measurement devices using feet	30	-	70		X
95. To read and interpret common measurement devices using inches	30	-	70		X
96. To read and interpret common measurement devices using pounds	30	20	50		X
97. To read and interpret common measurement devices using ounces	10	30	60		X
98. To read and interpret common measurement devices using unit notations	10	20	70		X
99. To measure using conventional unit notation: linear (length-distance)	20	-	80		X
100. To measure using conventional unit notation: weight (ounces-pounds)	20	10	70		X
101. To measure using conventional unit notation: size (area)	20	10	70		X
102. To measure using conventional unit notation: Volume (cubic)	20	20	60		X

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TASK ANALYSIS RESULTS FOR GRAIN DRIER OPERATOR

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Operating Grain Drying Equipment							
1. Moving grain by transportation vehicle to grain drier	100	-	-	30	40	30	40.0
2. Weighing and recording each load of arriving grain	100	-	-	20	60	30	45.0
3. Identifying potential safety hazards in working with grain drying equipment	100	-	-	20	30	40	38.0
4. Mechanically unload grain into the grid	100	-	20	20	50	20	40.0
5. Taking representative samples before, during and after drying grain	90	-	20	-	40	30	35.0
6. Weighing the appropriate amount from representative samples	90	-	10	10	50	20	35.0
7. Putting measured sample into moisture tester for instant percent moisture read out	90	-	-	10	40	40	39.0
8. Determining temperature of the representative sample	80	-	10	20	30	30	35.0
9. Determining air temperature and humidity at the time of sampling	60	10	20	10	40	20	34.0
10. Recording moisture percent, temperature of grain sample, air temperature and humidity	80	10	10	30	30	20	34.0
11. Mechanically operate the auger to the leg	100	-	20	10	40	30	38.0
12. Mechanically operate the leg for moving grain to an appropriate bin	90	-	-	-	50	40	40.0
13. Determining temperature and time for drying	90	-	-	-	30	60	42.0
14. Adjusting drier for desired drying time	100	-	-	10	30	60	45.0

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
15. Adjusting drier for appropriate cooling time	80	-	10	-	20	50	35.0
16. Mechanically dry the grain	90	-	-	10	40	40	39.0
17. Mechanically transfer grain from drier to appropriate bins	80	-	-	20	40	30	37.0
Shipping Grain							
18. Mechanically transfer grain from storage bins to loading bins	80	-	-	20	50	20	36.0
19. Mechanically or manually load transportation vehicle and weigh the load	90	-	10	20	50	20	38.0
20. Properly complete appropriate forms for transporting grain and have the transportation vehicle operator sign	80	-	-	-	50	40	40.0
Maintaining Buildings							
21. Cleaning the grain drying area	70	-	10	40	30	10	31.0
22. Selecting and purchasing appropriate paints	70	-	30	30	30	20	37.0
23. Preparing surface to be painted	70	-	50	-	30	10	27.0
24. Mixing paint and painting buildings as required	70	-	40	20	20	20	32.0
25. Repairing and hanging gates and doors	60	-	40	-	30	20	30.0
26. Repairing wood siding on buildings	70	10	40	20	20	10	26.0
27. Repairing minor leaks in roof of buildings	60	10	30	-	30	20	29.0

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
28. Developing bill of materials needed for repair	70	10	20	30	30	10	31.0
29. Determining costs of repairs needed	70	10	20	40	10	10	26.0
30. Replacing window panes	60	-	30	20	20	20	30.0
31. Repairing bracings	80	-	40	-	40	20	34.0
32. Mixing and pouring concrete	70	20	30	10	30	10	28.0
33. Building and removing concrete forms	70	10	40	10	30	10	29.0
Assembling and Installing Grain Elevator Equipment							
34. Reading and interpreting instructions for assembling and installing	90	-	10	20	50	20	38.0
35. Checking assembly instructions for any special tools or equipment needed	80	-	10	20	60	10	37.0
36. Checking packages for missing items and recording missing parts	80	10	-	30	40	20	36.0
37. Operating and selecting equipment used for constructing and installing grain elevator equipment	100	10	-	-	60	30	40.0
38. Interpreting symbols in constructing and installing grain elevator equipment	80	10	-	30	30	30	37.0
39. Inspecting grain elevator equipment for defects	90	-	10	10	50	30	40.0
40. Testing all moving parts on assembled equipment	90	-	-	10	50	40	43.0
41. Adjusting grain elevator equipment for proper operation	90	-	-	10	40	50	44.0

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Maintaining Electrical Equipment							
42. Installing electric motors	90	-	-	10	80	10	40.0
43. Cleaning and oiling electric motors	90	-	10	10	60	20	39.0
44. Repairing and replacing electrical cords	80	-	-	-	70	20	38.0
45. Replacing fuses	90	-	-	10	60	30	42.0
46. Replacing electrical switches	90	-	-	20	50	30	41.0
47. Resetting circuit breakers	90	-	-	10	60	30	42.0
48. Repairing and replacing electrical wires	90	-	10	20	50	20	38.0
49. Replacing lighting fixtures	90	-	10	30	40	20	37.0
Maintaining Plumbing Equipment							
50. Replacing water pipes	60	10	10	30	30	10	29.0
51. Repairing faucets	70	10	40	20	20	10	28.0
52. Replacing valves in water system	70	10	40	10	30	10	29.0
53. Replacing gaskets	70	20	20	20	30	10	29.0
Using Safety Practices							
54. Interpreting various safety symbols	90	-	-	10	70	20	41.0
55. Adjusting safety shield	90	-	-	-	80	20	42.0
56. Interpreting gauge readings on equipment	90	-	-	10	60	30	42.0
57. Connecting and disconnecting hazards and other grain transporting vehicles	90	-	-	-	70	30	43.0
58. Wearing appropriate clothing	80	-	-	20	50	30	41.0

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB SKILLS	PERCENT INDICATED ENTRY SKILL[a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					TOTAL WEIGHT[b]
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	
Preventing and Controlling Insects and Rodents							
59. Identifying insects and rodents which affect grain crops	60	10	-	20	40	20	33.0
60. Determining areas where insects and rodents are usually located and multiply	70	10	10	10	40	30	37.0
61. Identifying chemicals used to control insects and rodents	70	10	-	-	60	30	40.0
62. Selecting chemicals used to control insects and rodents	70	10	-	10	50	30	39.0
63. Purchasing chemicals used to control insects and rodents	70	10	-	30	30	30	37.0
64. Mixing chemicals used to control insects and rodents	80	10	-	-	50	40	41.0
65. Applying appropriate chemicals to control insects and rodents	80	10	-	10	40	40	40.0
66. Adjusting chemical applicators	80	10	10	10	40	40	42.0
67. Lubricating applicator	60	10	-	30	20	30	33.0
68. Cleaning and storing chemical applicator	70	10	10	20	20	30	32.0
69. Checking areas to determine if application was effective	60	10	-	10	40	30	35.0
70. Keeping records on chemical application operations	70	10	10	-	50	30	38.0
71. Using safety practices in applying chemicals	70	10	-	-	40	40	37.0

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB SKILLS	PERCENT INDICATED ENTRY SKILL [a] (N=10)	RELATIVE IMPORTANCE IN PERCENTAGES					
		NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	TOTAL WEIGHT[b]
Performing General Office Procedures							
72. Using the telephone	60	-	10	20	50	-	28.0
73. Writing letters	70	-	20	30	40	-	29.0
74. Filing various forms and reports	90	-	10	10	60	10	34.0
75. Meeting with workers and visitors	80	-	10	10	50	20	35.0

[a] The respondents were asked to indicate whether the skill was required within the first 60 days on the job.

[b] Each skill response was weighted according to its relative importance as follows: Not Needed = 1; Minor Importance = 2; Some Importance = 3; Very Important = 4; and Essential = 5. Total weight equals the sum of the weights of each category (Weight for each category is determined by the percentages of responses per category X weighted value of category).

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Operating Grain Drier Equipment					
1. Basic operating principles of trucks, tractors and trailers	60	-	40	X	
2. How to safely drive trucks and tractors	70	-	30	X	
3. Basic operating principles of weighing scales	40	20	40	X	
4. How to operate weighing scales	90	-	10	X	
5. Safety precautions necessary in operating drying equipment	80	-	10	X	
6. Reasons for using the grid in a grain drying operation	40	-	50	X	
7. Techniques of sample collection	70	-	30	X	
8. How to weigh samples	90	-	10	X	
9. Basic operating principles of a moisture tester	40	10	50	X	
10. How to read a thermometer	80	10	10	X	
11. How to read a humidifier	40	20	40	X	
12. Relationships of air temperature and humidity to grain moisture percentage	20	10	60		X
13. How to record temperature and humidity readings	50	-	50	X	
14. Basic operating principles of the auger and leg	70	10	20	X	
15. Basic storage principles of the grain drying system	60	10	20	X	
16. How to calculate temperature and time for drying grain with different percentages of moisture content	80	10	10	X	
17. How to adjust the drier equipment for desired temperature	90	10	-	X	
18. How to adjust the drier equipment for desired cooling time	80	-	20	X	
19. Basic operating principles of the grain drier	60	-	40	X	
20. How to operate the controls in drying grain	80	-	20	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Shipping Grain					
21. How to mechanically load grain	50	-	50	X	
22. How to complete forms in grain sales and shipment	70	-	20	X	
Maintaining Buildings					
23. How to safely clean the grain drying area	40	10	50	X	
24. How to select paints for painting various surfaces	30	30	40		X
25. How to prepare surfaces for the application of paint	40	30	30	X	
26. How to properly mix paint	40	20	40	X	
27. How to apply paint with a brush and spraying equipment	40	20	40	X	
28. How to thin paint	40	20	40	X	
29. How to clean brushes and equipment after painting	40	40	20	X	
30. How to repair doors and gates	30	30	40		X
31. Use of hinges in hanging doors and gates	30	40	30		X
32. How to measure, saw and replace wood siding	30	40	30		X
33. Uses of various roofing materials	30	30	40		X
34. How to set up and climb a ladder safely	40	20	40	X	
35. Reasons for knowing repair costs	30	30	40		X
36. How to measure and calculate material needed for repairs	40	20	40	X	
37. How to write up a bill of materials	20	40	40		X
38. How to calculate repair costs	20	30	50		X
39. How to replace window panes	40	40	20	X	
40. Use of bracing in building	30	20	50		X
41. Steps in mixing cement	30	40	30		X
42. How to determine ratios of cement, water and sand	30	20	50		X
43. How to mix cement with various equipment	30	30	40		X
44. How to build and remove concrete forms	30	30	40		X

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OCCUPATION: Grain Drier Operator

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Assembling and Installing Grain Elevator Equipment					
45. Manufacturer's instructions for assembling and installing equipment	70	-	30	X	
46. Use of appropriate special tools required for assembling equipment	60	10	30	X	
47. How to check parts against shipping lists	60	-	40	X	
48. How to use various hand and power tools required for constructing and installing equipment and buildings	60	10	30	X	
49. Meaning of various safety symbols	50	10	40	X	
50. How to correct various defects in grain elevator equipment	80	-	20	X	
51. How to test moving parts on elevator equipment	70	10	30	X	
52. How to adjust grain elevator equipment	80	-	10	X	
Maintaining Electrical Equipment					
53. Basic operating principles of electric motors	50	10	40	X	
54. How to clean and oil an electric motor	50	10	40	X	
55. Basic principles of electrical wiring	50	10	40	X	
56. Uses of electrical tape	50	20	30	X	
57. Simple soldering techniques	40	20	40	X	
58. How to replace fuses	80	20	10	X	
59. How to replace electrical switches	50	-	50	X	
60. How to reset circuit breakers	70	10	10	X	
61. How to repair electrical wires	50	-	50	X	
62. How to replace lighting fixtures	50	-	50	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
Maintaining Plumbing Equipment					
63. Simple plumbing techniques	40	20	40	X	
64. How to replace water pipes	30	30	40		X
65. How to repair faucets	40	30	30	X	
66. Uses of valves in the water system	40	30	30	X	
67. How to replace gaskets	40	20	40	X	
Using Safety Practices					
68. Meaning of various safety symbols	60	20	20	X	
69. The importance of using safety shields	70	-	30	X	
70. How to adjust safety shields for maximum protection	70	-	30	X	
71. How to read gauges on equipment	70	-	30	X	
72. Basic operation of various gauges	30	20	50		X
73. How to connect and disconnect wagons and other transporting vehicles	40	20	40	X	
74. The importance of selecting appropriate clothing for working	60	20	20	X	
Preventing and Controlling Insects and Rodents					
75. How to identify insects and rodents that affect stored grain	60	10	30	X	
76. Life cycles of various common insects and rodents	40	20	40	X	
77. How to identify chemicals used to control insects and rodents	50	10	40	X	
78. How to select chemicals most effective in controlling insects and rodents	60	10	30	X	
79. How to purchase chemicals for controlling insects and rodents	40	30	30	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB KNOWLEDGES	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
MUST UNDERSTAND:					
80. Manufacturer's warnings concerning safety precautions to take in handling various chemicals used in controlling insects and rodents	60	-	40	X	
81. Safe mixing of poisonous chemicals	60	10	30	X	
82. How to safely apply appropriate chemicals to control insects and rodents	60	10	30	X	
83. How to adjust chemical applicators	50	10	40	X	
84. Manufacturer's recommendations in lubricating chemical applicators	50	30	20	X	
85. How to clean and store chemical applicators	50	30	20	X	
86. How to determine whether chemical application was effective	50	10	40	X	
87. How to keep records on chemical applications	60	20	20	X	
88. Importance of keeping records on chemical applications	50	20	30	X	
89. Safety practices in applying poisonous chemicals	70	-	30	X	
Performing General Office Procedures					
90. How to use the telephone in a businesslike manner	60	20	20	X	
91. How to write effective business letters	60	20	20	X	
92. Simple filing procedures	80	20	-	X	
93. How to communicate effectively with workers and visitors	70	20	10	X	

[a] If 33 percent or more of the respondents indicated a knowledge was "essential", the job knowledge is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a job knowledge was "essential", the knowledge is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Exhibits neatness in --					
1. Handling tools and equipment	50	10	40	X	
2. Keeping supplies in order	50	10	40	X	
3. The work area and office	50	10	40	X	
4. Grooming and dressing appropriately for work	20	-	70		X
5. Setting examples for other employees in terms of working and other personal contacts in the work setting	50	10	40	X	
Shows dependability in --					
6. Completing work on time	70	-	30	X	
7. Arriving to work on time	80	-	20	X	
8. Coming back from "lunch" and "breaks" on time	80	-	20	X	
9. Reporting to the supervisor when there is a need to leave the work area or setting	70	-	30	X	
10. Coming to work regularly	90	-	10	X	
11. Following instructions and carrying out given tasks	90	-	10	X	
12. Reporting to supervisor abnormal situations in the work setting	90	-	10	X	
13. Delegating appropriate responsibility to other employees and making sure the given tasks were performed properly	60	10	30	X	
14. Accepting work setting problem reports and using appropriate supervisory techniques in correcting the problems reported	50	20	30	X	
15. Analyzing personnel problems and using viable supervisory means in solving problems	40	10	50	X	
16. Producing the best quality work	60	-	40	X	
17. Returning promptly all calls	60	10	30	X	
18. Being on time for appointments or calling ahead if detained	80	10	10	X	
19. Accepting and completing jobs assigned	80	-	20	X	
20. Being sure any reports or records are completed	70	10	20	X	
21. Being able to work with minimal supervision	70	-	30	X	
22. Being able to interpret and follow written and verbal directions	80	-	20	X	
23. Properly supervising other employees	40	20	40	X	

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
24. Anticipating need for and care of tools, equipment and supplies	70	-	30	X	
25. Demonstrating a concern for safety practices	80	-	20	X	
26. Being sure reports are forwarded to the appropriate person	80	-	20	X	
27. Planning and organizing work load	70	20	10	X	
Behaves courteously toward --					
28. Fellow employees	80	-	20	X	
29. Superiors	80	-	20	X	
30. Subordinates	70	-	30	X	
31. Visitors	70	-	30	X	
Is willing to work --					
32. With details	50	-	50	X	
33. With complex problems	30	10	60		X
34. With routine types of work	60	10	30	X	
35. With tools, machines and equipment	70	-	30	X	
36. With continuous job and work area change	40	-	60	X	
37. Under time pressure	50	-	50	X	
38. Under performance standard pressures	60	-	40	X	
39. On individual tasks for long periods of time	40	-	60	X	
40. On group tasks	40	10	50	X	
41. As a follower	40	20	40	X	
42. As a leader	50	10	40	X	
43. Under normal conditions	40	-	60	X	
44. Under abnormal conditions	50	10	40	X	
45. Things rather than people	50	10	40	X	
46. Performing preventive maintenance	70	-	30	X	
47. Using materials and supplies conservatively	60	-	40	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Confer with visitors in --					
48. Explaining the basic operation of equipment and systems when appropriate	20	30	50		X
49. Explaining solution to problems when appropriate	30	20	50		X
50. Locating various employees and site areas	30	10	60		X
51. Explaining the institution's policy	40	20	30	X	
Becoming involved in --					
52. Using Telephone for personal purposes	20	50	30		X
53. Responding to letter inquiries	20	10	70		X
54. Handling information from files	30	10	60		X
55. Releasing information concerning total operations	30	20	50		X
56. Improving ones scope of knowledge and ability	30	20	50		X
57. Technical and professional local associations	20	40	40		X
58. Technical and professional state assocations	30	40	30		X
59. Technical and professional national associations	20	40	40		X
60. Public relation activities	20	40	40		X
61. Employee relation activities	30	20	50		X
62. Local, state and federal political activities	20	60	20		X
63. Continuing education and personal upgrading	30	20	50		X
Displays --					
64. Leadership ability	40	-	60	X	
65. Accuracy in working	60	-	40	X	
66. Efficient work habits	70	-	30	X	
67. Confidence in working	60	-	40	X	
68. Loyalty toward employer and/or firm	70	-	30	X	
69. Desire to maintain acceptable personal physical condition	50	-	50	X	

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

JOB BEHAVIORS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
Demonstrates a concern for hazards in terms of --					
70. Safety and health of workers	70	-	30	X	
71. Safety to buildings and equipment	60	-	40	X	
72. Safety to the job	60	-	40	X	
73. Safety and health of visitors	80	-	20	X	
74. Company vehicles and demonstrates safe driving habits	80	-	10	X	

[a] If 33 percent or more of the respondents indicated a behavior was "essential", the behavior is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a behavior was "essential", the behavior is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
1. To be able to perform and apply simple mathematical functions: addition, subtraction, multiplication, division	60	-	40	X	
2. To have a basic understanding of algebra	10	20	70		X
3. To be able to read at a level commensurate with tasks performed	30	20	50		X
4. To be able to read and comprehend statistical and written data	20	20	60		X
5. To be able to write words and numbers legibly	60	10	30	X	
6. To have a good command of the English language		10	60		X
7. To be able to perceive color properly. (Color blind test)		-	80		X
8. Has dexterity adequate for the job		-	60		X
9. To be able to speak pleasantly and courteously in person and on communication devices	20	10	70		X
10. To be familiar with rules of grammar, spelling and punctuation	30	20	50		X
11. To be able to use alphabetic and numeric systems	40	10	50	X	
12. To be able to practice good safety measures and use first aid when necessary	40	-	60	X	
13. To be able to use necessary hand power tools at a safe and productive level	50	-	50	X	
14. To be able to read and interpret drawings and specifications	20	-	80		X
15. To be able to make drawings	20	10	70		X
16. To be able to maintain information and cost records for reporting purposes	20	10	60		X
17. To be able to manipulate and assemble parts	60	10	20	X	
18. Has a mechanical aptitude that will allow understanding of basic principles	60	10	30	X	
19. Must be able to stand for long periods of time	30	30	40		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
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BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
20. Has no physical impairments, such as serious back problems	80	-	20	X	
21. Must be able to run basic machine tools	50	10	40	X	
22. To have a basic understanding of trigonometry	-	80	20		X
23. To be able to use tools of electrical trade	30	20	50		X
24. To understand the use of all common electrical meters and testing devices	30	10	50		X
25. To be familiar with soldering	20	30	50		X
26. To understand electrical circuits	20	-	80		X
27. Knows Ohms law and electrical theory	-	50	50		X
28. Knows AC and DC current	10	20	70		X
29. To understand series and parallel circuits	10	20	70		X
30. To know relays, switches, transformers, capacitors, resistors, generators, batteries and magnetism	10	20	70		X
31. To understand the use of decimals in measuring tolerances and clearances	10	30	60		X
32. To recognize degrees of rotation. (example: 10 degrees)	10	20	70		X
33. To understand and properly complete manufacturer's warranty claim forms	20	10	70		X
34. Possesses good or corrected vision	50	-	50	X	
35. Possesses good or corrected hearing	30	10	60		X
36. To have an understanding of basic physical sciences	10	40	50		X
37. To be able to solve problems related to plane and solid geometry	-	20	20		X
38. To read and interpret common measurement devices, using feet, inches, pounds, ounces, unit rotation	10	10	80		X
39. To interpolate and extrapolate measurement values	10	20	70		X
40. To estimate and approximate measurements	10	20	70		X
41. To convert from one unit to another	10	20	70		X
42. To measure using conventional unit notation linear (length-distance), weight (ounces-pounds), size (area, and volume (cubic)	20	20	60		X

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
43. To read, interpret and use size-scale relationships	20	20	60		X
44. To record measurements using appropriate unit notation	20	20	60		X
45. To read and interpret basic graph relationships	20	30	50		X
46. To measure, compute, and estimate perimeter, areas and volumes	-	10	90		X
47. To read and interpret coefficient measurements	-	40	60		X
48. To read and interpret building trades measurements, specifications, indicated in table form	-	30	70		X
49. To read and interpret board feet measurements	10	40	50		X
50. To read and interpret carpenter's rules and measurements tapes	30	10	60		X
51. To read and interpret building codes	10	40	50		X
52. To read and interpret building permits, and licenses, the forming square, mechanical drawing relationships and orthographic projection views	-	40	60		X
53. To be able to discriminate between two-dimensional and three-dimensional patterns and objects	10	20	70		X
54. To demonstrate eye-hand coordination	20	20	60		X
55. To work or move readily about an elevated frame or structure with no fear of height	20	10	70		X
56. Maintain balance readily, is physically agile	30	10	60		X
57. Has physical strength and stamina needed to pursue exhausting work	20	-	80		X
58. Knows building trades vocabulary	-	40	60		X
59. To be able to use necessary hand tools at a safe and productive level	10	10	80		X
60. To be able to read at a level sufficient to understand and follow directions in equipment manuals and code books	10	-	90		X
61. To be able to read at a level to interpret labels, directions on labels and specifications in equipment manuals	40	-	60	X	

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CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
62. To understand electrical circuits used on control systems	10	10	80		X
63. To measure accurately to 0.01 inches	-	10	90		X
64. To understand basic operation of physical plant	10	30	60		X
65. To be able to record drawings	-	10	90		X
66. To operate a ten-key adding machine by the "touch system"	-	40	60		X
67. To be able to lift heavy objects	-	10	90		X
68. To be able to compare names and numbers accurately and quickly	10	20	70		X
69. Knows vocabulary of related industry	-	10	90		X
70. To be able to use the alphabetic and numeric systems when filing	10	20	70		X
71. To have a basic knowledge of geometry	-	40	60		X
72. To be able to write a clear and to the point letter	-	20	80		X
73. To be able to read and understand a county map	10	30	60		X
74. Is able to measure length to 1/4 of an inch	20	10	70		X
75. Is able to measure length to 1/8 of an inch	20	10	70		X
76. Is able to measure length to 1/16 of an inch	20	10	70		X
77. Is able to measure to 1/32 of an inch	20	10	70		X
78. Is able to measure temperature to $1^{o}F$	40	10	50	X	
79. Is able to measure volume by pints	10	20	70		X
80. Is able to measure volume by quarts	10	20	70		X
81. Is able to measure volume by gallons	10	20	70		X
82. Is able to measure using a micrometer to .020"	-	40	50		X
83. Is able to measure using a micrometer to .010"	-	40	60		X
84. Is able to measure using a micrometer to .002"	-	40	60		X
85. Is able to maintain a log of time and duration of stay on a job	40	10	50	X	
86. Is able to enter cost of items in columns and total them	30	20	50		X
87. Is able to determine sales tax	-	30	70		X

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VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS RESULTS

OCCUPATION: Grain Drier Operator

BASIC SKILLS	RELATIVE IMPORTANCE IN PERCENTAGES				
	ESSENTIAL	UNNECESSARY	DESIRABLE	ACCEPTED[a]	TO BE REVIEWED[b]
88. Is able to determine time on job and determine customer labor	10	20	70		X
89. Is able to transfer number sequences from a source to a column	10	20	70		X
90. Is able to add columns of numbers	20	10	70		X
91. Is able to understand money denominations	20	40	40		X
92. Is able to make change	10	50	40		X
93. Is able to lift heavy object; minimum of 75 pounds	-	10	90		X
94. To read and interpret common measurement devices using feet	30	10	60		X
95. To read and interpret common measurement devices using inches	30	10	60		X
96. To read and interpret common measurement devices using pounds	40	-	60	X	
97. To read and interpret common measurement devices using ounces	40	-	60	X	
98. To read and interpret common measurement devices using unit notation	10	20	70		X
99. To measure using conventional unit notation: linear (length-distance)	10	20	70		X
100. To measure using conventional unit notation: weight (ounces-pounds)	10	10	80		X
101. To measure using conventional unit notation: size (area)	10	20	70		X
102. To measure using conventional unit notation: volume (cubic)	10	20	70		X

[a] If 33 percent or more of the respondents indicated a skill was "essential", the skill is to be accepted and included in the modules.

[b] If less than 33 percent of the respondents declared that a skill was "essential", the skill is to be reviewed by module developers in order to determine whether this information should be included in the instructional modules.

APPENDIX A

TASK ANALYSIS SURVEY INSTRUMENTS
(SELECTED PAGES ONLY)

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT

VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

The Muskegon Area Intermediate School District has received funding for a combined Research and Program Development Project from the United States Department of Health, Education and Welfare. The project entitled, "A Study of Job Demands and Curriculum Development in Agricultural Training Related to the Muskegon County Wastewater Management System" is to become a national model educational program for training persons to work in farm irrigation systems similar to the Muskegon County Wastewater Management System. We are asking you to assist the Muskegon Intermediate School District in this needed research project by spending some of your precious time in reacting to this survey. The reason you are being asked to complete this survey is because of your expertise in the profession. In order to develop a relevant and meaningful national model educational program, we need your assistance in identifying the skills, knowledges and behaviors which a worker must possess in order to be proficient on the job.

NAME: _____ POSITION: _____

EMPLOYER: _____ TELEPHONE: _____

ADDRESS: _____

(STREET) (CITY) (STATE) (ZIP)

NUMBER OF YEARS EXPERIENCE IN OCCUPATION: _____

DATE: _____

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT

VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

DIRECTIONS:

A list of skills which are performed in a given occupation begins on the next page. Please check each item in the skills list indicating answers to the following:

1. Is the skill an entry level skill?

2. How important is it for an individual to know how to perform the skill in order to be proficient for entry level employment?

A list of words and definitions are listed below to assist you in understanding the terminology used in the instruments.

Entry Skill -- The skill was required of you when you first started this position (within the first 60 days).

Not Needed -- Skill does not apply for entry level employment.

Minor Importance -- Proficiency in performing this skill has no effect on entry level employment.

Some Importance -- Proficiency in performing this skill has some influence on entry level employment.

Very Important -- Proficiency in performing this skill has much influence or effect on entry level employment.

Essential -- Of great importance; proficiency in performing this skill is absolutely necessary for entry level employment.

Additional job skills may be listed at the end of this section.

MUSKEGON [illegible]A INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS

OCCUPATION: WASTEWATER TREATMENT OPERATOR 86.1

JOB SKILLS	*ENTRY SKILL YES	*ENTRY SKILL NO	RELATIVE IMPORTANCE: NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	CODE
Treating Waste								
1. Mechanically operate aeration equipment for desired treatment	___	___	___	___	___	___	___	86001
2. Inspecting meters, gauges and test results to determine required treatment	___	___	___	___	___	___	___	86002
3. Monitoring control panels for determining aeration action in waste	___	___	___	___	___	___	___	86003
4. Inspecting aerators	___	___	___	___	___	___	___	86004
5. Inspecting mixers	___	___	___	___	___	___	___	86005
6. Mechanically operating mixers	___	___	___	___	___	___	___	86006
7. Mechanically discharging effluent from aeration cell into settling tank	___	___	___	___	___	___	___	86007
8. Removing, disassembling and repairing aerators	___	___	___	___	___	___	___	86008
9. Reassembling and installing aerators	___	___	___	___	___	___	___	86009
10. Removing, disassembling and repairing mixers	___	___	___	___	___	___	___	86010
11. Reassembling and installing mixers	___	___	___	___	___	___	___	86011
12. Mechanically open and close settling tank gates	___	___	___	___	___	___	___	86012
13. Inspecting gates for obstructions	___	___	___	___	___	___	___	86013
14. Recording amount of effluent in settling tank	___	___	___	___	___	___	___	86014
15. Mechanically operate structures to regulate effluent flow to canals	___	___	___	___	___	___	___	86015

*It was required of you within the first 60 days on the job.

JOB KNOWLEDGES

DEFINITION: A mental activity; one understanding clearly the job and tasks involved; condition of being aware of something related to the job. In essence, if one knows how to perform a task (practical application), the individual should perhaps know the "theory" as well.

DIRECTION: A list of job knowledges needed in the occupation begins on the next page. Check each item in the knowledges list indicating the relative desirability of the item for your particular job.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS

OCCUPATION: WASTEWATER TREATMENT OPERATOR 86.1

JOB KNOWLEDGES	This Knowledge Is -- UNNECESSARY	DESIRABLE	ESSENTIAL	CODE
MUST UNDERSTAND:				
Treating Waste				
1. Biological processes which occur in the wastewater treatment aeration cells	___	___	___	86301
2. Basic operating principles of the aeration equipment	___	___	___	86302
3. The effects environmental conditions have on the aeration process	___	___	___	86303
4. Uses of meters and gauges in treating waste	___	___	___	86304
5. How to read meters and gauges	___	___	___	86305
6. The functions of meters and gauges in treating waste	___	___	___	86306
7. The operating principles of the monitoring control panels in treating waste and the importance for operating properly	___	___	___	86307
8. How to check aerators for proper functioning	___	___	___	86308
9. How to complete appropriate forms when checking conditions of aerators	___	___	___	86309
10. How to check mixers for proper functioning	___	___	___	86310
11. How to complete appropriate forms when checking conditions of mixers	___	___	___	86311
12. Basic operating principles of mixing equipment	___	___	___	86312
13. The effects environmental conditions have on the mixing process	___	___	___	86313
14. Basic operating principles of gates in treating and discharging waste	___	___	___	86314
15. Relationship of head and gate opening and flow of waste	___	___	___	86315
16. Biological and physical processes which occur in the settling tanks	___	___	___	86316
17. The importance of selecting and using appropriate tasks for removing, disassembling, repairing, reassembling and installing aerators	___	___	___	86317
18. The importance of using safety practices in removing and installing aerators	___	___	___	86318
19. How to remove, disassemble and repair aerators	___	___	___	86319
20. How to reassemble and install aerators	___	___	___	86320
21. The importance of selecting and using appropriate tools for removing, disassembling, repairing, reassembling and installing mixers	___	___	___	86321
22. The importance of using safety practices in removing and installing mixers	___	___	___	86322

BEHAVIORS

DEFINITION: The manner in which an individual behaves; social conduct, attitudes, personality

DIRECTION: A list of behaviors needed for the occupation begins on the next page. Check each item in the behaviors list indicating the relative desirability of the item for your particular job.

Additional behaviors may be listed at the end of this section.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS

OCCUPATION: _____

BEHAVIORS	THIS BEHAVIOR IS -- UNNECESSARY	DESIRABLE	ESSENTIAL	CODE
Exhibits neatness in --				
1. Handling tools and equipment	___	___	___	86601
2. Keeping supplies in order	___	___	___	86602
3. The work area and office	___	___	___	86603
4. Grooming and dressing appropriately for work	___	___	___	86604
5. Setting examples for other employees in terms of working and other personal contacts in the work setting	___	___	___	86605
Shows dependability in --				
6. Completing work on time	___	___	___	86606
7. Arriving to work on time	___	___	___	86607
8. Coming back from "lunch" and "breaks" on time	___	___	___	86608
9. Reporting to the supervisor when there is a need to leave the work area or setting	___	___	___	86609
10. Coming to work regularly	___	___	___	86610
11. Following instructions and carrying out given tasks	___	___	___	86611
12. Reporting to supervisor abnormal situations in the work setting	___	___	___	86612
13. Delegating appropriate responsibility to other employees and making sure the given tasks were performed properly	___	___	___	86613
14. Accepting work setting problem reports and using appropriate supervisory techniques in correcting the problems reported	___	___	___	86614
15. Analyzing personnel problems and using viable supervisory means in solving problems	___	___	___	86615
16. Producing the best quality work	___	___	___	86616
17. Returning promptly all calls	___	___	___	86617
18. Being on time for appointments or calling ahead if detained	___	___	___	86618
19. Accepting and completing jobs assigned	___	___	___	86619
20. Being sure any reports or records are completed	___	___	___	86620
21. Being able to work with minimal supervision	___	___	___	86621
22. Being able to interpret and follow written and verbal directions	___	___	___	86622
23. Properly supervising other employees	___	___	___	86623
24. Anticipating need for and care of tools, equipment and supplies	___	___	___	86624
25. Demonstrating a concern for safety practices	___	___	___	86625

BASIC SKILLS

DEFINITION: The ability to use mathematics, reading, writing communication and any other skills considered necessary in order to begin training toward an occupational goal.

DIRECTIONS: A list of basic skills needed for the occupation begins on the next page. Check each item in the basic skills list indicating the relative desirability of the item for your particular job.

Additional basic skills may be listed at the end of this section.

MUSKEGON A[illegible] INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS

OCCUPATION: _____

BASIC SKILLS	THIS BASIC SKILL IS -- UNNECESSARY	DESIRABLE	ESSENTIAL	CODE
1. To be able to perform and apply simple mathematical functions: addition, subtraction, multiplication, division	___	___	___	86701
2. To have a basic understanding of algebra	___	___	___	86702
3. To be able to read at a level commensurate with tasks performed	___	___	___	86703
4. To be able to read and comprehend statistical and written data	___	___	___	86704
5. To be able to write words and numbers legibly	___	___	___	86705
6. To have a good command of the English language	___	___	___	86706
7. To be able to perceive color properly. (color blind test)	___	___	___	86707
8. Has dexterity adequate for the job	___	___	___	86708
9. To be able to speak pleasantly and courteously in person and on communication devices	___	___	___	86709
10. To be familiar with rules of grammar, spelling, and punctuation	___	___	___	86710
11. To be able to use alphabetic and numeric systems	___	___	___	86711
12. To be able to practice good safety measures and use first aid when necessary	___	___	___	86712
13. To be able to use necessary hand power tools at a safe and productive level	___	___	___	86713
14. To be able to read and interpret drawings and specifications	___	___	___	86714
15. To be able to make drawings	___	___	___	86715
16. To be able to maintain information and cost records for reporting purposes	___	___	___	86716
17. To be able to manipulate and assemble parts	___	___	___	86717
18. Has a mechanical aptitude that will allow understanding of basic principles	___	___	___	86718
19. Must be able to stand for long periods of time	___	___	___	86719
20. Has no physical impairments, such as serious back problems	___	___	___	86720
21. Must be able to run basic machine tools	___	___	___	86721
22. To have a basic understanding of trigonometry	___	___	___	86722
23. To be able to use tools of electrical trade	___	___	___	86723
24. To understand the use of all common electrical meters and testing devices	___	___	___	86724
25. To be familiar with soldering	___	___	___	86725

APPENDIX B

INFORMATION USED TO TRAIN DATA COLLECTORS

TASK ANALYSIS TRAINING SESSION

I. The Task Analysis Phase

A. Selection of the agricultural occupations related to the Muskegon County Wastewater Management System to be studied

1. Wastewater Treatment Operator
2. Wastewater Treatment Laboratory Technician
3. Farm Manager (Cash Grain)
4. Field Supervisor (Cash Grain)
5. Farm Equipment Operator (Cash Grain)
6. Grain - Drier
7. Irrigator (Sprinkler System)
8. Agricultural Equipment Mechanic

B. Steps in making the task analysis

1. Collect information from the Muskegon County Wastewater Management System Employees relative to specific occupations
2. Review Competence lists and materials developed by Michigan State University and other agencies. (Curriculum Laboratories, State Departments of Education, Private and Public Agencies, Colleges and Universities.)
3. Design instruments for data collection
4. Develop instruments for agricultural occupations related to the Muskegon County Wastewater Management System

C. Data Collection

1. Select individuals to assist in collection data
   a. Curriculum Specialist
   b. Vocational Agriculture Instructors
   c. Others

2. The job of the data collector

   a. Identify businesses to contact. (Grain Farmers, farm implement repair, etc.)

   b. List businesses to cover

   c. Contact the operator (owner, manager, foreman, supervisor, or other individuals responsible for operations.)

      (1) Explain the purpose of the research project and ask for cooperation.

         (a) Introductions

         (b) "This is a research project conducted by the Muskegon Area Intermediate School District and I have been asked to assist . . . . . "

         (c) "We want to prepare boys and girls so they will be qualified for a job upon High School or Community College graduation."

         (d) "We want our graduates from High School and Community College Programs to accept a job in an organization such as yours, at a level above those filled by those you hire off the street."

         (e) "We want to prepare our students for the skills, knowledges and attitudes you expect High School and Community College students to possess when they begin work."

         (f) "There are four sections to this questionnaire in which we would like to have you and/or several of your employees to react to and they are job skills, job knowledges, behaviors and basic skills."

         (g) "We want you and/or your workers to tell us how important each item really is in order to be proficient on the job."

         (h) We want at least _____ to complete the questionnaire. "Can _____ of your employees help us?"

(2) Distribute appropriate questionnaires to workers. (If a worker is a farm equipment operator, the individual should be given the farm equipment operator questionnaire and not the irrigator questionnaire or some other inappropriate questionnaire.)

(a) Explain questionnaire and where checks should be placed. Cover job skills, job knowledges, behaviors and basic skills.

(3) Collect the Critical Incident Lists. Make Sure each section to the questionnaire is completed.

(4) Return completed Critical Incident Lists to:

Dr. Eddie A. Moore
M. A. I. S. D. Annex
1611 East Oak Street
Muskegon, Michigan 49442

SPECIAL FOOTNOTE:

* In our experience we have found it necessary to follow one of the following procedures:

1. Contact workers either individually or in groups. In group settings or individual interviews, we thoroughly explain the research project and each section of the questionnaire. We usually assist individuals and groups in completing questionnaires.

2. We have left the questionnaires with an owner and/or manager. He would administer and collect the questionnaires and we would pick them up on a later visit.

APPENDIX C

LIST OF INDIVIDUALS WHO ASSISTED IN THE TASK ANALYSIS PHASE OF THE PROJECT

	Position, Address
Mr. Philip Carter	Instructor of Vocational Agriculture Shelby High School Shelby, MI
Ms. Jan Danford	Former Director of Curriculum and Instruction Captial Area Career Center Mason, MI
Mr. Keith Griffin	Instructor of Vocational Agriculture Montague High School Montague, MI
Mr. Roger Peacock	Instructor of Vocational Agriculture Coopersville Area Public Schools Coopersville, MI
Mr. Jack Sanderson	Instructor of Vocational Agriculture Fremont High School Fremont, MI
Mr. Walter Weber	Instructor of Vocational Agriculture Ravenna High School Ravenna, MI
Mr. Lee Wever	Instructor of Vocational Agriculture Newago County Vocational Center Fremont, MI

APPENDIX D

LIST OF UNIVERSITIES WHO PROVIDED THE STAFF WITH TASK ANALYSIS INFORMATION

Agricultural and Natural Resources Education Institute
Michigan State University
East Lansing, Michigan

Department of Agricultural and Industrial Education
The Montana State University
Bozeman, Montana

Department of Agriculture Education
The Ohio State University
Columbus, Ohio